TRIDENT RESISTER'S

HANDBOOK

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THIS HANDBOOK IS DEDICATED
TO THE RELIEF OF ALL WHO SUFFER
BECAUSE WE SQUANDER OUR WEALTH, TALENT, AND RESOURCES
ON TRIDENT

Cover graphics by Bill Livermore.

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FOREWORD

This *Trident Resister's Handbook* describes in detail a system of present and future death. Trident's killing has already begun. Just as it can kill entire nations abroad in the future, Trident is now killing people in the two nations which are building and deploying it, the United States and Britain. Consider these four points:

1) In the 1992 US presidential campaign and the British election earlier that year, the major candidates ignored the connection between economic militarism and the deepening suffering of inner-city populations. The needs of city people for decent education, jobs, housing, etc. in the face of billions of dollars and pounds of continued nuclear weapons spending were bypassed in both British and US elections. Can we who live in these cities find another way to cast our ballots? Can we vote by nonviolent direct action?

2) The US and Britain are committed to completing *eight more* Trident submarines, five for the US and three for Britain. The US has already sent to sea 13 Trident submarines, carrying 2,496 nuclear warheads, with the combined explosive power of over 28,000 Hiroshima bombs (in addition to the other two legs of the strategic triad, with thousands of more nuclear warheads in underground missile silos and intercontinental bombers). Given the end of both the Soviet Union and the Cold War, why are our governments continuing to build *eight more* Trident submarines?

3) The missile propellants for the US and British Tridents continue to be shipped by rail, at the rate of one per week (and are scheduled to be so shipped for years to come), through some of the same city populations which suffer most from the economic underside of nuclear weapons wastefulness -- San Jose, Oakland, Sacramento, Reno, Ogden, Salt Lake City, Pueblo, Topeka, Lawrence, Kansas City, St. Louis, East St. Louis, Evansville, Nashville, Birmingham, Chattanooga, Atlanta, and Jacksonville. The shipments endanger almost daily, by the threat of fire and explosion, the very people they are already destroying by upside-down budget priorities. Can we show by nonviolent action the intolerable connection represented by these trains?

4) One of America's best known educators, Father Theodore Hesburgh, former Notre Dame president, observed in a speech (to Business Executives for National Security at Stamford, Connecticut, 9 October 1991) that by the year 2000 one-third of US minority populations will be unemployable because of lack of education. He then said, "Give me the two-billion-dollar budget for **one Trident submarine** and I can turn around the education of minorities in the country." A British educator could have said, "Give me the 23 billion pounds that our government is prepared to spend over the next 20 years for four Trident submarines and I can turn around the education of our neediest citizens." Why can't this turn-around be done now in both the US and Britain?

These pages tell us all we need to know for a responsible choice. Whereas Trident means death now and in the future, accepting responsibility to convert Trident to human resources would mean life for many. Will we choose life?

Jim Douglass
Birmingham, Alabama

PREFACE

Trident is the icon of our violent society. It epitomizes the destructiveness, the hatred, the greediness of our collective public attitude. The Trident submarine and missile system is the most devastating icon humankind has ever produced. It is proper that we focus on changing both our attitude and society's icon.

We must keep in mind that stopping Trident will not cure our society. The roots of Trident run much deeper than the weapon itself. Peace and justice will come only when we root out the violence in each of us. A paragraph from the old Pacific Life Community statement on nonviolence expresses this well:

> ... nonviolence is the force of truth sought ever more deeply in each of our lives, and expressed ever more directly in our relations with others. Nonviolence begins by facing the Trident in ourselves, whether that Trident be the death-dealing source of our own income, an affluent and exploitive way of life, our indifference to the struggles of suffering friends and global neighbors -- whatever form our particular ego-centered rejections of the human family may take. If we can begin to respond truthfully to our own Tridents, then we can also respond in truth to the world-destructive Trident... Nonviolence is a constant experiment in deepening in truth, and in testing the truth by betting our lives on it in the world.

Striving to abolish weapons is not good enough. When we adopt a more penetrating goal -- that is, transforming the source rather than smashing the image -- we are beginning to understand what Trident resistance is all about.

It is my hope that this handbook will help in achieving those goals. The loose-leaf arrangement is geared toward timely updating. By filling out the handbook registration card, you will receive periodic updated pages and directions for inserting them, and the bill will only be for printing, packaging and postage. You will not receive these updates unless you send in the registration card.

In this handbook I shall use the American spelling of words, simply because it is easier for me (and the spelling checker on my word processor). However, for proper names, titles, and quotations I have tried to adhere to the British spelling where applicable (defence v. defense, programme v. program, judgement v. judgment, scepticism v. skepticism, armour v. armor, etc.).

An index could serve some purpose but I feel it is not feasible to maintain during the constant updating that I expect this handbook to experience. In order to partially compensate, I have made the "Contents" as descriptive as possible.

Most of the insight and ideas come from others who have written on the various subjects. Some authors have impressed me with their concepts and understanding, and I have paraphrased liberally from them after giving them credit as the source.

This handbook is not designed as a volume to read from cover to cover and then store on the shelf. Rather, it is intended to be a ready reference of information and knowledge that will promote informed dialogue and responsible resistance.

In order to make this handbook an evolving tool, I urge the readers to submit corrections, suggested additions, or any other ideas which might come to mind. Particularly, I encourage concrete suggestions for the nonviolent alternatives and the resources sections. It is my hope that this handbook will become a community project of the International Trident Resistance Network.

One other point. Throughout this handbook I refer to the weapons-reduction agreement which took place on 16 June 1992 as the "Bush-Yeltsin agreement." It has now been named "START-2." Corrections in this nomenclature will be made during revisions to this handbook.

I wish to thank all who have contributed and still contribute to the compilation of this handbook. The names are now too numerous to list, but this handbook would not be possible without help from many on both sides of the Atlantic. My special appreciation and thanks goes to Janet, whose encouragement and love has kept me going.

May peace be with you all.

Bob Aldridge
Santa Clara, California

FINANCING POLICY

I have chosen the *Trident Resister's Handbook* as my personal contribution to the Peace and Justice Movement. All labor is donated. Also, all reimbursements requested are for expenses only. But I have had to define a method of financing this project by which I only charge expenses and yet obtain enough donations to keep the project moving. That method for the US edition is as follows.

The original (first run) cost for the new *Trident Resister's Handbook* came from two sources:

1. $333 -- half of my expense reimbursement from "Nuclear-Free Local Authorities" of Manchester, England for participating in an anti-Trident conference at Glasgow, Scotland in 1992. (The other half went toward publication of the British edition.)
2. $350 -- a grant from the Agape Foundation in San Francisco, California.

These two figures add up to $683, which I consider the revolving fund target level for the Trident Resister's Handbook project. If the revolving fund ever exceeds that amount (counting the value of handbooks in inventory, which seldom exceed ten) the excess will be deducted from cost of the next update. If the revolving fund drops below that amount, the deficit will be added to the cost of the next update.

Periodic updates affect the revolving fund in a negative manner. About half-a-dozen complimentary copies plus updating the handbooks in inventory contribute toward the total revision cost. This cost is amortized among the remaining handbook holders. But since there is not a 100-percent response to my "Request for Reimbursement," full costs have never been recovered. Some people do donate more than is requested and that helps to offset the deficit.

In order to keep interested people from paying an unfair amount, a new policy regarding reimbursment will commence in 1995. Any handbook holder who has failed to reimburse for the two previous revisions will be assumed to no longer have use for the *Trident Resister's Handbook* and will be removed from the distribution list. Hardship cases will be given consideration.

The sale of new *Trident Resister's Handbooks* helps the revolving fund in a positive way. The reimbursement requested for each handbook remains at the original $15 plus postage. That may seem high since reprints, even though there are now more pages, are still cheaper than the original batch because certain "development" costs no longer appear. However, new handbooks are always completely updated with all revisions. Since reimbursements for new handbooks go into the revolving fund, any excess over actual reprinting expenses helps to defray the revolving fund deficit and thereby makes future revisions cheaper for everyone.

In summary, the total reimbursement requested for each revision will be the revolving fund target ($683) less the actual revolving fund balance (after expenses for the revision). If the actual balance exceeds the target there will be no reimbursement requested. Postage will also fit into this formula. In this manner there will be no profit involved, and the distribution of expenses will be as fair as possible.

Bob Aldridge
Santa Clara, California

SECTION 1
UNDERSTANDING
THE NEW WORLD ORDER

1.1 THE ECONOMIC ASPECT: UNBRIDLED EXPLOITATION OF THE THIRD WORLD

Resisting Trident reaches much farther than just stopping the weapons system. It reaches to correcting the root problems which make war machines like Trident possible. This chapter will discuss the economic aspect of President Bush's New World Order, which is what that order is all about. But first a clarification on terminology. The word "imperialism" has rhetorical connotations which sometimes defy meaning. But in this handbook it is not used in the rhetorical sense. The word is used to convey its strictest dictionary meaning:

> imperialism (izm) n. 1. imperial state, authority, or system of government. 2. the policy and practice of forming and maintaining an empire in seeking to control raw materials and world markets by the conquest of other countries, the establishment of colonies, etc. 3. the policy and practice of seeking to dominate the economic or political affairs of undeveloped areas or weaker countries. [*Webster's New World Dictionary* (NY, Simon & Schuster, 1984) 2d college edition, p. 704]

With that in mind, I will now describe how Bush's New World Order has this planet in an economic stranglehold. Rob Steven's article, "Imperialism Strengthened," describes Bush's New World Order as well as any I have read. [*Third World War*, pp. 6-10] In Section A below I shall be paraphrasing from that article.

A. BUSH'S NEW WORLD ORDER: AN HISTORICAL CONTEXT

Capitalism is a system where production is for profit. It has three basic stages: 1) borrowing money to invest from the banks, 2) setting up factories to extract raw materials and produce commodities, and 3) selling or marketing the commodity. When problems occur at any one of these stages, they interfere with profits and capitalism does not work. Capitalist imperialism is the ability of businesses to relocate their problems to another area and, consequently, the entire chain from production to consumer may stretch across the planet and take place in many countries. Bank loans would be obtained in some highly-developed country. Cheap wages, lax environmental and health regulations, and abundant raw materials would most likely be available in the Third World. If people in one location cannot afford high prices, the product is sold elsewhere. And so on it goes.

Capitalism is not to be confused with free enterprise where everyone has an equal chance to make a living. Only the large and powerful corporations have the ability to relocate problems and maximize profits. For that reason, it is only these corporations to which banks wish to loan money. So the powerful become more powerful and the weaker fall by the wayside. We are seeing this happen in the auto-making industry, the airlines, the food and other marketing chains, and, yes, even the banks -- we are seeing this happen in virtually every area of business, service, and trade.

Imperialism, according to Steven, has now reached its third level and has been dubbed the New World Order. Let me briefly describe all three levels.

1. Level One: Classical Imperialism.

Prior to World War II there existed a type of imperialism which had been in place for centuries. In what I shall call classical imperialism, an imperialist power controlled its colonies and did not share the wealth of its colonies with any other power. In essence, each of these powers held control over specific and separate areas of the world. If another power infringed upon that area there would be a war. World War II was an imperialist war, at least in the Pacific theater, because Japan tried to extend its colonial domain into areas dominated by Americans, Britains, and Dutch.

This classical system is how most people still envision imperialism. And because this system no longer exists, people are led to believe that imperialism no longer exists. In reality imperialism is stronger than ever today but in a different form.

2. Level Two: Neo-Colonialism.

After World War II, national liberation movements began to have political successes in gaining control of government in former colonies. Also after World War II, the Soviet Union emerged as a competitive superpower. Classical imperialism could no longer be enforced because the Soviet Union tended to back these liberation struggles. If the imperialist powers -- America, Japan, and Europe -- pushed too hard there was danger of major nuclear war. This was the Cold War era.

However, imperialist powers did intervene militarily as far as they could, and they succeeded in cultivating a ruling elite which was sympathetic to capitalist enterprises. Thus these Third World leaders -- enterprising ruling families, opportunist sheikdoms, ruthless dictators, and vested-interest presidents -- created a favorable business climate whereby foreign companies could exploit the best land, the cheap labor, and the valuable raw materials for their own profit. Production in this manner also perpetuated the lavish lifestyle in developed countries.

Nevertheless, direct military force by the dominant powers was dangerous in the Cold War era. A more circuitous form of intervention was preferred. So sympathetic indigenous forces were aided and supplied -- whether they be the ruling government or guerrilla insurgents, or another Third World country. Aid to the faction which served the giver's interest came from both sides of the iron curtain. In general, capitalist powers supported the upper class in the neo-colonies, whereas socialist powers backed the lower class. Under this system imperialist wars became regional battles between the upper ruling class and the rebelling lower class. Because of this the arms trade (euphemized as military aid) bloomed as a prosperous endeavor.

UNBRIDLED EXPLOITATION

In addition to the changed nature of imperialist wars, another difference between classical imperialism and neo-colonization is that the imperialist powers shared the benefit of the colonies. This was necessary in order to give the puppet colonial leaders some semblance of authority. Sharing was also brought about to some extent because the dominant powers cooperated in setting up the sympathetic colonial government. But possibly the biggest reason for the shared exploitation of colonies was the emergence of huge trans-national corporations with more capital than many of the smaller nations. As big business merged across political boundaries, those boundaries became less significant. And as these corporations gained control of the imperialist powers, those powers created policy favorable to corporate business and trade. This was the imperialism practiced during the Cold War.

3. Level Three: The New World Order.

The Cold War started thawing during the 1980s, and ended once and for all in 1991. Likewise, Soviet influence in the Third World diminished and finally sputtered out. Imperialism then went through another transformation, and the New World Order was conceived.

Heralding this New World Order was Japan's rise to equal the US in economic clout. Also the rise of giant banks, industry, and trading companies in Japan and Europe -- establishments so powerful that they could act globally on an equal with America's. The US is no longer the single super-imperialist power.

In addition to that, the US economy became so depleted by military spending during the Reagan and Bush administrations that the White House began pressuring its allies to assume a greater share of keeping sympathetic Third World governments in power. Policing the world is no longer a US monopoly.

Meanwhile the trans-national corporations continue to conglomerate to fewer, stronger, and more influential enterprises. Technical and economic collusion is becoming more pronounced as Third World countries lose their wealth to the First World at an increasing rate. And with the collapse of the USSR there is no longer a large power backing those who oppose this exploitation. On the contrary, the Soviet Union's successor, the CIS, seems anxious to side with America, Japan, Britain, France, and Germany in suppressing indigenous opposition.

Unlike the exclusive control of colonies in classical imperialism, and the reliance on US military strength needed for neo-colonialism, control of Third World countries in the New World Order is carried out by coalitions of military powers. Such coalitions have so far been led by the United States and work under the moral authority of the United Nations, which it controls, as a means of legitimizing imperialist activities. This political-military cooperation is gaining momentum.

4. The New World Order And The Third World.

Liberation movements face new obstacles under the New World Order. First, they are not backed by a major power such as the USSR or the eastern European countries. Second, the military regimes which liberation movements are attempting to overthrow are not being backed by just one imperialist power, but by blocs of imperialist powers working together to protect their business interests and behavior. Seven aspects of that behavior prolong underdevelopment and incite unrest.

a. **Control of Production.** Monopolizing production by foreign investors is a widespread and growing practice. Only large corporations with ties to the banks can compete, thus local businesses are driven into bankruptcy.

b. **Export of Products.** As large companies gain control of production, they tend to grow or produce what can be exported to countries where the profit is greatest. The domestic market receives very little.

c. **A Skewed Growth Pattern.** Large companies choose a product which can be made more competitively than anywhere else. Competition is world wide and each country ends up with a narrow range of productivity.

d. **Balance of Payments Problems.** With only one or two special products being produced in an underdeveloped country, that country becomes heavily dependent on imports. Under the conditions existing, imports outweigh exports and the country cannot balance its trade revenues, or its national budget.

e. **Chronic Debt.** Since payments cannot be balanced, the underdeveloped country is continually and increasingly in debt. Loans are impossible to obtain because banks will only lend to big corporations which can compete and survive. Debt, and consequently development, is controlled by outside interests and manipulated to the advantage of those interests.

f. **Unemployment and Low Wages.** Unemployment, underemployment, and very low wages go together. Highly-competitive large corporations drive local companies out of business and provide imported commodities cheaper than can be produced locally. In this manner the New World Order destroys more local jobs than it creates. Those that are created are low-paying. Contrary to many claims, once a country opens to free trade and foreign investment, that country is driven to chronic underemployment and low wages.

g. **Militarization of Politics.** Increasingly tight security is needed to prevent an underdeveloped country from revolting, and to prevent liberation movements from achieving political victories. As more people become disgruntled, liberation movements are more popularly supported. But the form of security has changed with the New World Order. With no more Soviet influence, preventing the spread of communism in the Third World is no longer a valid excuse for military intervention. Military intervention to preserve ruling regimes has become more pronounced, such as the "liberation" of Kuwait. If necessary, the US war machine can and will be brought into play to save a smaller ally. As Stevens says, "those kinds of wars have been called 'Third-World Wars' because they are wars against the Third World by coalitions of imperialist powers under the legitimizing banner of the United Nations. [*Third World War*, p. 11]

B. FREE TRADE: THE CORPORATE NOOSE

Free trade has been in the forefront of public attention in recent years. It has been described as a boon for consumers and a stimulus for economic growth. That may be true as far as it goes, but what we have been hearing is the sunny side which only applies to those who live in developed countries. The purpose here is to expose the dark side of free trade.

According to Richard Barnett and John Cavanaugh, only a few hundred giant trans-national corporations dominate global commerce. Many of them are bigger and more powerful than most sovereign nations. Barnett and Cavanaugh say the "most disturbing aspect of this global system is that the formidable power and mobility of global corporations are undermining the effectiveness of national governments to carry out essential policies on behalf of their people." They go on to explain that business enterprises "that routinely operate across borders are linking far-flung pieces of territory into a new world economy that bypasses all sorts of political arrangements and conventions." And they conclude with the observation that national leaders "no longer have the ability to comprehend, much less control, these giants because they are mobile, and like the mythic Greek figure Proteus they are constantly changing appearances to suit different circumstances." [Barnett & Cavanaugh, pp. 14 & 27]

1. The Roots of Free Trade.

Free trade is the instrument of these giant corporations. It might better be described as a license for big business to maximize profits with minimum government interference. Profit maximization creates a dark side of any free-trade agreement, and it plagues the poorer nations.

a. **The Group of 7 (G-7).** Free trade is spearheaded by the world's seven richest countries, known as the Group of Seven (G-7). Those countries are the United States, Britain, France, Germany, Italy, Canada, and Japan. Combined they account for over 70 percent of the world's economy. At the G-7's 20th economic summit meeting in

Naples, Italy during July 1994, a program called "Open Markets 2000" was proposed by the US -- an initiative aimed at maintaining and even accelerating global talks for trade liberalization.

Nevertheless, there is diplomatic rivalry among those seven richest nations. Japan and the US are feuding over what Americans see as Japan's failure to liberalize trade with the US. During the 1994 summit France, competing with the US for economic control of Europe, led opposition to the US proposal for global free trade by the year 2000. But that proposal was put on the agenda for next year. Also slated for next year's economic summit are proposals to overhaul cold-war institutions such as the United Nations, the World Bank, and the International Monetary Fund.

There is also disagreement on who should belong and how many members there should be. According to the G-7's yardstick of industrial output to measure a nation's economy, Spain in 1992 exceeded Canada. And according to a different scale used by the World Bank and International Monetary Fund, China is the second largest economy in the world and India comes in a number five.

Discussion goes on about G-7 membership but there seems to be an underlying reason why only industrialized countries are included. Although the G-7 does the overt strategizing for the world economy, and the annual economic summit is attended by the seven heads of state, the substance of their activity helps the international business community to maximize profits. Given the heavy lobbying in the US by large businesses, and the funding those businesses generate to put sympathetic candidates into office, it seems logical to assume that the agenda for G-7 meetings is influenced by the business community. "Open Markets 2000" substantiates that premise. It seems safe to assume that the other six member-governments are influenced in a like manner.

Although there is bickering and competition among the G-7 heads of state, there is a coherent strategy among the business leaders who seem to be pulling the strings. It is interesting to note that the G-7 makeup coincides geographically with the Trilateral Commission.

b. **The Trilateral Commission (TLC).** In the early 1970s the Council on Foreign Relations, which has existed since World War I under the aegis of the Rockefeller empire, published a position paper stating that it must "come to grips with strategy for modifying the behavior of all relevant actors in the international community -- individuals, governments, agencies within governments, elite groups, industrial firms, interest groups, mass societies, and other groups and organizations at the sub-national and trans-national level." [cited in *Year One*, p. 13] Business leader David Rockefeller of Exxon and Chase-Manhatten Bank, vocalized the corporate desire for a world without borders where transnational corporations would have no "interference from nation-states." He called for "a massive public relations campaign," a "crusade of understanding" to explain why nation states, with all their territorial bickering, must be phased out. [Quoted in Barnett & Muller, pp. 20-21; cited in Nelson, p. 22]

The Trilateral Commission (TLC) was founded by David Rockefeller and Zbigniew Brzezinsky in 1973 under the aegis of the Council on Foreign Relations. TLC has a membership of some 300 "private" citizens made up of heads of trans-national corporations, bankers, politicians, and a few academics. They come exclusively from North America, western Europe, and Japan, and meet yearly at various capital cities. Regional headquarters of the TLC are set up in Paris, New York, and Tokyo.

The Ford administration was the transition administration under which the TLC was formed, although President Gerald Ford was not a TLC member. The subsequent Carter administration was inundated with 26 on-leave TLC members in key posts, although members are dropped from the roster while in public service. President Jimmy Carter was one and his National Security Advisor was TLC co-founder Zbigniew Brzezinsky. [See Addendum-A for a partial listing.]

The TLC took a back seat during the 8-year Reagan administration because Ronald Reagan was more inclined toward the saber-rattling Committee on the Present Danger. Nevertheless, a free-trade zone in Mexico was established in 1982 and a free-trade agreement with Canada was completed in 1988. (Both to be discussed below.) But TLC member (on leave) George Bush brought trilateralism back to the Oval Office when he was elected President in 1988. At that time the concept of free trade started making headway. As the new US Trade Representative, Bush appointed Carla Hills, member of the board of directors for IBM, American Airlines, and Standard Oil. [See Addendum-A]

The Clinton administration is infested with on-leave TLC members, starting with President Bill Clinton himself. [See Addendum-A for a listing] Free trade has been a major item on the Clinton agenda. He has completed the NAFTA and GATT free-trade agreements and has taken significant strides toward bringing free trade to the Asia-Pacific region and the remainder of Latin America.

2. The Effects of Free Trade.

Martin Kohr also warned underdeveloped countries about jumping into a free-trade agreement. [*Third World War*, pp. 21-24] It is extremely dangerous to view free trade -- that is, freedom of operation in terms of importing, exporting and investment -- as good for all parties concerned. The inevitable downward spiral of a small or economically-depressed country which enters into an agreement with these powers has already been discussed. Some examples are in order.

a. Environmental, Safety, and Health Considerations. Free trade means weakened environmental standards, looser health and safety laws for both workers and consumers. For instance, under the 1988 free-trade agreement Canada challenged the US ban on importing and using asbestos, a ban which the Environmental Protection Agency estimated would save 1,900 lives by the year 2000. Canada's Quebec province has a substantial interest in the mining and manufacturing of asbestos. An October 1991 decision by the US Court of Appeals upheld the Canadian objection on the ground that other alternatives less disruptive to industry had not been investigated.

Under GATT, existing US laws, from federal on down, which protect the public and the laborers will be subject to review and change to "harmonize" with lower standards practiced by other countries. Examples are pesticides and food contaminants. These less-restrictive standards are set by such industry-influenced organizations as Codex Alimentarius of Rome. Codex allows US-banned DDT and levels of other pesticides up to fifty times higher than what is allowed in the US. Under NAFTA or GATT, virtually any domestic law can be overturned or slackened if it is "trade-restrictive" or "trade-distorting" -- interpreted in the corporate world as profit-restrictive or profit-distorting. Ralph Nader says that GATT's new World Trade Organization has a target list of US laws regulating food safety, fuel efficiency, clean air, recycling, and many other matters including the Nuclear Nonproliferation Act of 1978. [Nader]

State laws will be even more at risk because they would face federal judicial review or sanctions from its own national government. Taking California as an example, it is estimated that some 90 state laws will have to be repealed to comply with GATT. Robert Strumberg, author of "Impact of GATT on State Law -- California," warns that "Free trade under GATT is not free. The loss of state lawmaking capacity is the price we will pay..." [cited in *Mercury News*, 3 October 1994, p. 13C] Judith Barish, director of the California Fair Trade Campaign, adds that "California's impressive record of social and environmental legislation is particularly at risk. Our state is the Ground Zero for the devastating effects of the GATT." [cited in *Mercury News*, 3 October 1994, p. 13C] Examples of state laws which conflict with GATT are auto emission standards, commercial quality standards for produce, small-business subsidies, warnings of health risk on products, and the unitary tax treatment of transnational corporations. Under the guise of impediments to free-trade (to be discussed below), big business can have laws repealed which interfere with their aim to maximize profits.

b. **Child Labor**. Most of this section is taken from an article by Lynn Kamm. [Kamm, pp. 10-11] The International Labor Organization estimates there are 200 million child laborers worldwide. Some 10 million of those are estimated by the US Labor Department to be working in export industries. Some other International Labor Organization statistics are:

-- 95% of all child laborers are in poorer countries.

-- 25% of child laborers in some regions are age 10-14.

-- 50% of child laborers live in Asia.

-- 33% of children in Africa are child laborers.

-- Up to 26% of children in some Latin American countries are child laborers.

Transnational corporations maximize their profits to a great extent by using cheap child labor. Although poverty, cultural acceptance of children working, and scant educational opportunities are frequently cited to justify child labor; greedy employers, public indifference, government corruption, and social prejudice promotes acceptance of child exploitation.

In 1974 the *U.S. Trade Act* was signed into law. It mandated that workers rights be a top negotiating priority in GATT negotiations, and one specific right was a specific minimum age for child workers. But GATT was negotiated, signed and ratified without any such provisions. One lame alibi is that poorer nations were able to block the issue from the agenda -- an unlikely event if the US had really insisted. A more likely reason, according to Bill Goold, a recognized authority on child labor, is that the Reagan, Bush, and Clinton administrations were more interested in currying favor with big business than spending any political capital for workers' rights. As far as worker's rights making any headway in the newly-established World Trade Organization established under GATT, Goold sees little prospect of success. He says that while US corporations give lip service to connecting workers' rights to trade laws, they "are very skillful and effective in orchestrating opposition to linkage without having to be out front doing so." [Kamm, p. 11]

C. THE INSTRUMENTS OF FREE TRADE

The major free-trade agreements are the North American Free Trade Agreement (NAFTA), the General Agreement on Tariffs and Trade (GATT), and the Asia-Pacific Economic Cooperation (APEC) forum. Another instrument is the Favored Nation Status between the US and another country. The Clinton administration has been expediting free trade agreements. These agreements have been described in various media articles but it would be helpful to bring all the data together at this point.

1. The North American Free-Trade Agreement (NAFTA).

This economic treaty among the US, Mexico and Canada is not the first free-trade agreement for North America. A 12-mile strip of Mexico along its 2,000-mile border with the US, known as the maquiladora (assembly plant) zone, has been a free-trade zone since 1982. At the time that zone was established, the average pay for a factory worker was $1.53 per hour. Now, with some 2,000 US factories relocated to Mexico, the pay has dropped to 60-cents an hour. Many of the half-million Mexican workers are children only 13-14 years old. The 12-mile free-trade belt has become an environmental nightmare with pollution causing major hepatitis outbreaks in neighboring Texas and Arizona. Some 67 deformed or retarded children have been born to factory workers at only one US factory. According to Ralph Nader, a "random study of US-owned factories in Mexico found not a single one that was in compliance with Mexican environmental laws." [Priest, p. 68] NAFTA will spread these conditions to all of Mexico. And as more companies move to Mexico the US will lose over half a million jobs.

Canada signed a free-trade agreement with the US in 1988. Since then, some 460,000 Canadian jobs have been lost as large US corporations absorb Canadian businesses. A Canadian government program to plant forest trees has been stopped because of it being an "unfair subsidy" to the timber industry. Under the terms of the 1988 free-trade agreement it is impossible for Canada to practice responsible forest management or control the lumber products being exported to the US. NAFTA expands on that previous agreement.

NAFTA was approved by Congress on 17 November 1993 and took effect on 1 January 1994. On 10 January 1994 the US Supreme Court rejected a lawsuit which would have forced the President to conduct an environmental assessment before NAFTA became law. That let stand an appeals court decision which said the President has sole authority to negotiate treaties and without judicial interference. [*Public Citizen and Sierra Club vs. US Trade Representative*, 93-560] NAFTA will be in force for fifteen years unless abrogated with the prescribed time of notice.

It was not by chance that the Chiapas uprising started in early January 1994 when NAFTA went into effect. They know that NAFTA will make their entire country a maquiladora zone, and that deplorable working conditions and slave wages will spread. Chiapas leader, Commander Marcos, labeled NAFTA a "death certificate for the Indian peoples of Mexico." [Priest, p. 6b] In Mexico, NAFTA is known by its Spanish initials TLC. A Mexican political cartoon features a shabbily-dressed peasant screaming "TLC -- Tierra, Libertad y Comida (translated "Land, Liberty and Food). [Schrader, p. 25A]

In retrospect, a year after NAFTA went into effect, even advocates of the pact admit it was oversold regarding the jobs and wealth it would bring in all three countries. Terry Karl, director of the Center for Latin American Studies at Stanford University, says the people were defrauded on NAFTA "because to sell the pact politically its benefits had to be exaggerated, its promise had to be exaggerated, and its potential problems had to be downplayed. [cited in *Mercury News*, 4 February 1995, p. 7D]

Mexico has been particularly hard hit. Its economy is in recession, the peso has been devalued, and the government is seeking loans to stay afloat. Delal Baer, a political scientist at the Center for Strategic and International Studies in Washington, D.C. says what happened "is that Mexicans actually purchased too much, they were buying too many of our goods as a result of trade liberalization. It was wonderful while it lasted for American exporters, but Mexico just couldn't keep buying and buying forever." [cited in *Mercury News*, 4 February 1995, p. 7D] US exports to Mexico in 1994 rose 17 percent over 1993, to $114.5 billion.

It was predicted before devaluation of the peso that 1995 would see another 20 percent jump. Now, with American goods suddenly 40 percent more expensive in the Mexican economy, exports are expected to drop. It was also predicted that NAFTA would create 190,000 US jobs by 1998. Now jobs are expected to decline in 1995. US President Bill Clinton has offered a $20-billion US credit package that could make Mexico even more dependent on the US. It will require that Mexico tighten its money supply and keep interest rates high, thus fueling a Mexican recession. As collateral for the loan, the US will have claim to the billions of dollars in Mexican oil sales -- Mexico's largest single-source of foreign revenue.

Meanwhile, because the devalued peso makes Mexican products cheaper in the US, Mexico's exports are expected to rise 25 percent (by $16 billion) in 1995. This will cause a greater trade imbalance on the US side. Exacerbating the US unemployment figure, more illegal but cheap Mexican labor is expected to migrate to the US where there are better-paying jobs.

a. From NAFTA to AFTA. Hardly had NAFTA gone into effect than the Clinton administration kicked off negotiations to expand that treaty to the entire western hemisphere into what could be called the Americas Free Trade Agreement (AFTA). Chile would be first -- a signal that countries can join one-by-one -- and the rest of Central and South America during the next decade. That would bring another 750 million consumers to the corporate marketplace dominated by the US which controls three-quarters of the western hemisphere's wealth.

A Summit of the Americas held in Miami, Florida during December 1994 was attended by 34 nations -- every nation in the hemisphere except Cuba. A date of 2005 was set to complete all negotiations toward a hemispheric free-trade zone. AFTA would replace NAFTA and five other free-trade agreements in Latin America. [See Addendum-B for details.] The 5-page Declaration of Principles and 23-page Plan of Action give lip service to human rights, environmental hazards, public needs and safety, and anti-drug trafficking but the provisions are vague and weak. The main theme is to create tariff-free borders. The centerpiece is free trade.

2. The General Agreement on Tariffs and Trade (GATT).

GATT presently comprises 124 nations. It was first signed by 23 countries in 1947. In the following year, 57 countries drafted the International Trade Organization charter which was defeated by the US Congress for fear of losing control over trade. 45,000 tariff cuts were adopted, however. The second round of talks in 1949 added 5,000 tariff cuts, and a third round in 1950 resulted in 8,700 additional cuts. A fourth round in 1956 added tariff cuts covering $2.5-billion in trade. In 1960-61 the Dillon Round led to an additional 4,400 concessions covering $4.9-billion in trade, and the 1964-67 Kennedy Round added more cuts covering a whopping $40-billion in trade. A seventh round of talks, the Tokyo Round, during 1973-79 slashed tariffs on more than $300-billion worth of trade.

The recently concluded Uruguay Round started in 1986 and agreement was reached on 15 December 1993 -- over seven years later. The impasse in this round epitomizes the increasing powerlessness of Third World countries. A back-room agreement among the industrialized powers resulted in a take-it-or-leave-it proposition for GATT members. No negotiations of terms was tolerated. If a lesser-developed country presented its side, it was put off as a "micro problem" amid an attempt to solve "macro problems." Industrialized nations forced poorer states to accept regulations which tightened the rules against those states. In exchange for allowing big businesses to maneuver more freely in and out of world markets, the smaller countries received vague promises about some better access to marketing at some unspecified future date.

As a result, the Uruguay round was more far-reaching than the previous seven which reduced tariffs only on manufactured goods. The final agreement at Uruguay also reduces tariffs on agricultural goods, intellectual property, and services; restricts impediments to trade; and creats the World Trade Organization. Let us look at these aspects.

a. **Free Trade in Agriculture.** This applies to investment in farming and farm products. When local governments try to regulate the effect on the environment, the hazards of pesticides, the dangers of food irradiation, occupational safety, depletion of resources, and similar concerns, it may be declared a violation of the GATT agreement and thus set aside. Industrialized nations would be able to operate with impunity in the Third World.

b. **Free Trade in Intellectual Property.** Intellectual property covers everything from music, writing, and art to computer software and new-technology patents. GATT will liberalize control of intellectual property in some areas and tighten it in others, which ever is in the interest of the few countries which dominate GATT negotiations. GATT will cause Third World governments to police their own people in order to insure the monopolization of local talent and its creations by trans-national corporations.

c. **Free Trade in Services.** The US and other developed countries want to open capitalist opportunities in services such as banking, insurance, communications, media, professional services, tour agencies, accounting, advertising, etc. Currently these service industries form a greater share of the gross national product in the US and other developed countries than does manufacturing or agriculture. If included under free trade, the trans-nationalization of local service companies will spell the end of the last economic sector still indigenously controlled in the Third World.

d. **Impediments to Trade.** The Uruguay Round also addressed impediments to trade such as subsidies, "dumping" of goods at below-market value, counterfeiting, discriminating tax structures, and investment restrictions. Not all of the goals were achieved in the final agreement (services pertaining to films, audio, and ocean-going shipping are not included) but the results are still astonishing.

e. **The World Trade Organization (WTO).** The Uruguay Round also gives GATT more clout through creation of the WTO to mediate disputes and enforce GATT rules. An offending nation will have three choices: negotiate a settlement, change its laws, or face harsh trade sanctions. WTO tribunals will operate in secrecy without input from any organization or person below the national level.

Tariff cuts are to be implemented over time and fully effective by 2002. Still unsure about whether the US is giving away more than it receives, or just how much national sovereignty the US is relegating to the World Trade Organization, Congress on 1 December 1994 completed ratification of the 22,000-page GATT document and it was signed into law by President Clinton on 8 December 1994.

It is not generally known that GATT will cost US taxpayers an estimated $20 billion over the next ten years -- some estimates are $4 billion a year. Congress is bound by budget rules to make up for the revenues lost as taxes are phased out on hundreds of imports. Although Congress is supposedly forbidden to compensate by cutting social programs, if current practices are followed it will be the low-income bracket that makes up this difference.

3. *The Asian-Pacific Economic Cooperation (APEC) Forum.*

APEC was formed in 1989 by the US to examine ways of cooperating toward economic growth. It has 18 Pacific-rim member countries -- Australia, Brunei, Canada, Chile, China, Hong Kong, Indonesia, Japan, South Korea, Mexico, Malaysia, New Zealand, Papua New Guinea, Philippines, Singapore, Taiwan, Thailand, and US.

APEC would be a juicy plum for American business ventures. Asia contains two billion potential consumers, about $1-trillion in infrastructure projects will be opened for bid during the next few years, and the average annual economic growth is projected to be 6- to 7-percent over the next decade. Also, in most APEC countries the US has a trade deficit. The US hopes to eliminate barriers and double exports over the next decade.

Some Asian-Pacific nations are wary. They fear that their developing industries will be overwhelmed by competition. Malaysia boycotted the November 1993 APEC summit in Seattle, Washington because it sees APEC as a plot to dominate the region. Thailand and Indonesia prefer that APEC be a consultative forum with no policy-making authority. China and the Philippines want their industrial capacity to mature more before committing to a free-trade agreement. Since APEC operates on consensus (100 percent agreement) even the smallest nation could block US aspirations. But with NAFTA and GATT negotiations out of the way, the Clinton administration is putting much effort on APEC.

In November 1994 the annual APEC summit was held in Jakarta, Indonesia. The forum promised to reduce trade barriers and have free-and-open trade-and-investment among APEC's industrialized members (Australia, Canada, Japan, New Zealand, and US) by 2010, with full APEC economic integration by 2020. Specific guidelines were worked out at the November 1995 summit in Osaka, Japan.

Other goals agreed to in 1994 are to reduce economic disparities and promote social well being; to set up cooperative programs in education & training, science, and technology (including technology transfer); and to cooperate on environmental issues with the aim of sustainable development. The controversial questions of human rights and labor issues were deliberately ducked.

Malaysia and China are the main obstacles to US goals. Malaysia wants to form a free trade bloc in East Asia from which the US is excluded. Beijing is holding out until Washington helps China become a founding member of the new World Trade Organization under GATT, despite the Chinese closed market and state-supported industries.

4. *Most Favored Nations.*

The Generalized System of Preferences (GSP) Program awards the most favored nation status to help eligible developing countries by providing duty-free trade on specific products -- a form of unilaterally-bestowed free-trade arrangement. The United Nations

Conference on Trade and Development proposed the concept in the mid-1960s. Sixteen donor countries (the EU counted as one donor) have now adopted their own versions of the GSP Program. Conflict with Article I of the GATT agreement has been overcome by a permanent waiver passed during the 1979 Tokyo round of negotiations, which allows more favorable treatment of developing countries. The GSP Program was authorized in the US by Title V of the Trade Act of 1974 (P.L. 93-618, 3 January 1975) and re-authorized by the Trade and Tariff Act of 1984 (P.L. 98-573, 30 October 1984).

The GSP Program is administered by the GSP Subcommittee of the interagency Trade Policy Staff Committee which in turn reports to the administration's Trade Policy Review Group. The GSP Subcommittee is chaired by the US Trade Representative and consists of members from the Departments of Agriculture, Commerce, Interior, Labor, State, and Treasury. Some 145 countries and territories now receive most favored nation status from the US for a wide range of selected products, not necessarily the same for each country. In practice it allows US-based transnational corporations to open factories in the recipient nation and then export the products duty-free to the US for marketing.

China, touted as the world's biggest and fastest-growing market, epitomizes the manner in which the preferential trade treatment is skewed toward business interests. During re-authorization of the GSP Program in 1984, Congress added new eligibility requirements which included observation of internationally recognized workers rights and effective protection of intellectual property (patents, copyrights and trademarks). When China's most favored nation status came up for renewal in 1994, the Clinton administration tried to get Beijing to clean up its human rights violations. However, when negotiations got down to the wire, the pressure of big business influenced trade renewal with China in spite of human rights abuses. Now the trade-renewal dispute with China is over piracy of intellectual property. US software firms alone have lost $800 million in retail sales because of illegal copying of their work. This time the dispute involves business interests, and the US may take a harder line toward China.

D. CORPORATE CONTROL OF FREE TRADE.

Members of the corporate community have monopolized the advisors and architects of free-trade agreements.

1. NAFTA.

NAFTA was written by George Bush's business friends. In the secret drafting meetings there were over 1000 advisors from the corporate community -- only five represented environmental groups and none represented consumer, labor and health groups.

It appears that some environmental organizations which came out in favor of NAFTA have been co-opted by big money. As stated in *Integrities*:

> The World Wildlife Fund, National Wildlife Federation, National Resources Defense Council, Environmental Defense Fund, Defenders of Wildlife, the National Audubon Society and the Nature

> Conservancy have come out in support of NAFTA. That list is impressive. But Alexander Cockburn did some research on the subject and found that, previous to its endorsement of NAFTA, World Wildlife Fund had received a $2.5-million check from Eastman Kodak, whose CEO founded NAFTA's biggest corporate lobby. National Wildlife Federation receives financial support from Dow Chemical, DuPont, Monsanto, 3M, Shell, Pennzoil and Waste Management. Audubon [Society] receives money from General Electric, Waste Management and pro-NAFTA Proctor & Gamble. The Nature Conservancy accepted more than $2-million from NAFTA-supporter Coca Cola and lesser sums from Tenneco, Cargill, DuPont, Phillip Morris, Waste Management and Proctor & Gamble. This does not prove that big money produced the endorsements, but it makes one mighty suspicious! The Sierra Club, Greenpeace, and Friends of the Earth remain firmly opposed to NAFTA, and have criticized the other groups for their "play along" tactics.

2. *GATT and the WTO.*

The US strategy during GATT negotiations was crafted by James D. Robinson III, chief executive officer for American Express. As one of the world's biggest transnational corporations, American Express is seeking free access to financial markets worldwide. Daniel Amstutz, former senior vice president of Cargill, drafted GATT's agricultural agreement. Cargill has an enormous financial stake in reducing agricultural restrictions around the globe. Official negotiators of GATT were advised by over 1,000 representatives from the business world.

The secret tribunals which will decide what domestic laws violate free-trade agreements are heavily influenced by industry. And Codex Alimentarius, which has been vested by NAFTA and GATT to set acceptable levels of food contaminants for most of the world, is also top-heavy with industry representatives. Out of 28 US delegates to CODEX, 16 come from food or agri-chemical transnational corporations -- including three from Nestles and one each from Coca Cola, Pepsi, Hershey, Ralston Purina, Craft and CPC International. Nestles sends delegates from many nations and is better represented than most countries. This is the makeup of the institution which sets the standard to which our health and environmental laws must adhere.

GATT establish the World Trade Organization which will have more power to settle disputes among members. Some foresee that it will be more powerful than the United Nations. It has been described as a global corporate utopia in which local citizens, labor unions, environmental groups, and consumer advocates are powerless. It will operate in a secrecy which hides conflicts of interest, economic straits imposed on poor countries, inadequate workers' rights, and devastating environmental practices. Karen Lehman of the Institute for Agricultural and Trade Policy said, "[Free trade] will have more power to determine what we eat, how we handle our garbage, whether we handle other people's garbage ... than our own legislature." [Cited in Dawkins and Muffett]

Ralph Nader, in his 10 October 1994 article in *The Nation*, points out that 51 leaders of major news organizations and journalism groups urged President Clinton to open World Trade deliberations to the public and press. Nader says that five anti-democratic areas of concern are "a lockout of the press and the public from WTO tribunals; suppression of the briefs and other documents presented by governments that are parties to disputes before these tribunals; denial of citizens' right to petition; the absence of conflict-in-interest standards for the tribunals' three trade specialists, who act as judges and may simultaneously pursue private business careers; and a prohibition of any independent appeals of WTO tribunal decisions. The perfunctory internal appeals process within the WTO is secret." [cited in Nader]

E. THE IMF AND THE WORLD BANK.

Like GATT, the International Monetary Fund (IMF) and the World Bank are controlled by the developed and industrialized nations, principally the United States. The IMF finances large-scale economic changes and the World Bank funds individual development projects. These organizations have been described as the capitalist world's premier economic fraternities. Membership gives access to billions of dollars in loans, but those loans have many conditions attached. The new member country must agree to strict IMF "reforms," one of which is to move to a free-market economy under the IMF's harsh free-market restrictions. This is the arena in which capitalist countries excel.

An August 1992 *Los Angeles Times* dispatch quotes a report saying that the "economic policies advocated by the World Bank and the International Monetary Fund are contributing to a Third World environmental crisis that is undermining the very development strategies the international leaders seek to promote." [*Mercury News*, 31 August 1992, p. 2A] Using the Philippines as an example, the article says that lending policies stress a borrowing country's industrial development at the cost of depleting natural resources.

It is naive to say that the IMF and World Bank are working against goals to develop a country because no such goals ever existed except as public relations propaganda. Walden Bello, executive director for the Institute for Food and Development Policy (Food First), said that since its inception in 1944 "the World Bank has been a closely held and controlled arm of US foreign policy, largely free from constraints of legislative, judicial or popular influence." He points out that "what has changed over time is the level of bitterness and distrust with which the Bank is viewed by those who are targeted for 'development.' For them the Bank's structural adjustment policies have brought despair and devastated living standards. For environmentalists, the recent increase in the Bank's lending program, from $20 billion in 1991 to $25 billion in 1992, has signaled an increased capacity to wreak havoc on nature." [Bello, p. 20] Bello cites three sophisticated and blunt mechanisms by which the US uses the World Bank as a political weapon. They apply likewise to the IMF which is also controlled by the US. First, the Bank provides a means to punish or reward countries for their degree of cooperation with US policy. Second, it is used to bring Third World countries into a US-dominated international capitalist economy. And third, the Bank is used as a collection agency for debts owed American banks, but at the expense of Third World living conditions.

1. A Means of Punishment and Reward for a Country's Degree of Cooperation with US Policies.

A 1982 Treasury Department report says the US had its way in 12 out of 14 major World Bank decisions. [Treasury Department, "Assessment of US Participation in the Multinational Banks in the 1980s," Consultation draft, 21 September 1981, Chapter 3; cited in Bello, p. 21] The cut off of Bank funds to Chile heralded the fall of Allende in 1973. The same tactic was used against Nicaragua during the 1980s. Any country defined as an enemy by the US would lose World Bank funding.

On the other end of the stick, the World Bank has been used to help countries such as China, when diplomatic relations are tenuous, if it serves US interests. Over $8.5 billion in World Bank loans went to China during the 1980s, a period when it would have been impossible to promote such aid through Congress. World Bank loans to ten countries considered vital to US interests -- Argentina, Brazil, Indonesia, Mexico, Morocco, Pakistan, the Philippines, Thailand, Tunisia and Turkey -- total over $7 billion. And because its share towards those loans is only $60 million, the US realizes over a hundred-fold increase in dollar impact by channeling them through the World Bank.

2. A Means of Bringing Third World Countries into a US-Dominated Global Capitalist Economy.

It was the noble goals for the World Bank and IMF formulated by the liberals of the mid-1940s that has led world opinion to believe that those institutions were a means of helping poor countries develop. But the conservatives who actually designed the two institutions had no such illusions. From the start it was their intention to promote a post World War II international economic order based on capitalism and controlled by the United States.

Bringing the Third-World people into the capitalist scheme was not meant to give them an equal place. Theirs would be the role of production at cheap wages earned in unhealthy conditions while their environment and lifestyle deteriorate. Towards the capitalist goal of free trade, "development" loans had strings attached which encouraged an export economy -- specialization in a product for sale elsewhere and away from a self-sustaining economic structure. All the bad effects of such free trade on the local people -- cheap wages, devalued currency and cutting social-needs to make their export product more competitive, giving control of the economy to foreign investors, little regulation of imports needed for manufacture -- have been described above. But forcing free trade and an export economy onto the local people is done by attaching conditions to the only source of funding they have.

3. A Means of Collecting Debts for US banks at the Expense of Third World Living Standards.

Under the Reagan administration of the 1980s, the World Bank and IMF cast off the last of its pretensions about humanitarian goals. They became first and foremost a means of policing US interests. One of their functions was to collect debts. Between

1984 and 1991 some $155 billion flowed from poor countries through the IMF/World Bank to primarily US banks. This drain is depressing living standards in debtor countries and bringing immense suffering to poor people -- particularly in Latin America and Africa. Health, dietary and educational needs are dwindling while natural resources are being ravaged to meet interest payments. If countries won't cooperate with the World Bank/IMF collection structure they are given a bad rating which essentially bars them from obtaining loans from any source. In this manner the US keeps the Third World under control while protecting its own banks.

So we can see that when a Third World country joins the IMF or World Bank in order to obtain financing for economic improvement and development projects, it is moving into the clutches of capitalist powers. Russia and twelve other former Soviet republics were formally admitted into the World Bank and IMF in April 1992. Although Russian President Yeltsin has proclaimed that he will not allow the West to dictate his economic reform, reality will unfold as the future moves on. The World Bank and the IMF served capitalism well during the neo-colonialist period. They will become even more unfettered under the New World Order. Third World countries would be smart to heed Walden Bello's warning that "the World Bank is an integral part of the system of Northern domination of the South. Abolishing it, not reforming it, must be the Southern agenda." [Bello, p. 25] The same is true of the IMF.

F. CONCLUSION

In his 1993 annual report to the General Assembly, United Nations Secretary General Boutros Boutros-Ghali said: "The gap between the world's richest and poorest countries is widening, yet that shocking fact is more often than not greeted with indifference.... No task is greater or more urgent than to impress upon the economically leading nations that the world cannot ultimately prosper if the poorest continue to suffer and decline. To illustrate that growing disparity, in 1960 the richest 20 percent of the world's population held 60 percent of the world's wealth. Today it holds 83 percent. That same 20 percent also consumes 80 percent of the world's resources.

If conditions are to improve for our impoverished brothers and sisters, and this planet is to be kept livable for our future generations, free-trade as it exists today must be changed. Perhaps the best way to do that is to remove the corporate monopoly so that wiser decision-making is possible. That will open the door to true economics when all people's good shall be each person's rule.

Failing that, the Council on Foreign Relations dream of controlling the world will be realized.

* * * * *

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ADDENDUM-A TO CHAPTER 1.1

Some of the trilateralists in the Carter administration were Jimmy Carter (President), Zbigniew Brzezinsky (National Security Advisor), Walter Mondale (Vice President), Cyrus Vance (Secretary of State), W. Michael Bloomenthal (Secretary of Treasury), Harold Brown (Secretary of Defense), Warren Christopher (Deputy Secretary of State), Richard N. Cooper (Under Secretary of State for Economic Affairs), Richard Holbrooke (Under Secretary of State for East Asian and Pacific Affairs), and C. Fred Bergsten (Assistant Secretary of Treasury for International Economic Affairs). [*Parade*] Andrew Young (Ambassador to the UN) was also a trilateralist. [Nelson, p. 23]

Some TLC advisors to President Carter were Lane Kirkland (Secretary-Treasurer of the AFL/CIO), Harry Owens (Director of Foreign Policies Studies at the Brookings Institution), Leonard Woodcock (President of the United Automobile Workers), Robert Roosa (partner with Brown Brothers, Harriman & Company), and J. Paul Austin (Chairman of Coca Cola Company). [*Parade*]

Some trilateralists in the Bush administration were George Bush (President), Brent Scowcroft (National Security Advisor), Carla Hills (US Trade Representative), James Baker (Secretary of State), Robert Mosbacher (Secretary of Commerce), and Michael Boskin (Council of Economic Advisors Chairman). [Nelson, p. 26]

Trilateralists on the September 1993 TLC membership list who went into the Clinton administration are Bill Clinton (President), Warren Christopher (Secretary of State), Bruce Babbitt (Secretary of Interior), Peter Tarnoff (Under Secretary of State for Political Affairs), Clifton R. Wharton, Jr. (former Deputy Secretary of State), Graham Allison (Assistant Secretary of Defense for Plans and Policy), Richard Holbrooke (Ambassador to Germany), James R. Jones (Ambassador to Mexico), Walter F. Mondale (Ambassador to Japan), Strobe Talbott (Ambassador at Large and Special Advisor to the Secretary of State on Newly Independent States and Russia), David Gergan (assistant to the President on communications), Joseph S. Nye (Chairman of the National Intelligence Council, CIA), and Alan Greenspan (Chairman of the US Federal Reserve System). [Nelson, p. 23]

US corporations represented in the TLC include American Airlines, AT&T, Bank of America, Boeing, Coca Cola, DuPont, General Electric, IBM, Owens Corning Fiberglass, Proctor & Gamble, Shell Oil, Black & Decker, General Foods, and Westinghouse. [Nelson, p. 26]

This listing in this Addendum is not complete for the US and does not delve into TLC membership in other countries. For a more complete treatment of trilateralism please consult the references.

ADDENDUM-B TO CHAPTER 1.1

An Americas Free Trade Agreement (AFTA) which is planned to be in place by 2005 would subsume six other agreements: (1) NAFTA, an existing free-trade agreement among Canada, Mexico, and the US; (2) the Group of Three, a free-trade agreement by 1995 among Colombia, Mexico, and Venezuela; (3) Mercosur, a common market to be in place by 1995 among Argentina, Brazil, Paraguay, and Uruguay; (4) Andean Pact, a common market by 1995 among Bolivia, Colombia, Ecuador, Peru, and Venezuela, although the border dispute between Peru and Ecuador may affect this; (5) Caricom, a potential common market among 13 Caribbean countries, excluding Haiti and the Dominican Republic; and (6) the Central American Common Market which would eliminate regional tariffs among Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua.

1.2 MILITARY STRATEGY: SECURING AMERICA'S INTERESTS

Military ambitions pre-date recorded history. And military doctrine is driven by technology. New discoveries invariably find their proving grounds in a martial application. Such was the case from the discovery of metal to nuclear energy. Since World War 2, and the advent of the military-industrial complex, the progression of military applications has been significant in the area of protecting America's economic adventurism. It has stunted the development of alternative forms of conflict resolution.

When studying US military strategy one must understand the meaning **"national interests"** and **"national security."** As we saw in Chapter 1.1, the overriding national interest is economic. From that it follows that it is business interests that need security. Therefore, the term "national interests" can be translated to "business interests," and "national security" to "corporate security." With these definitions in mind let us proceed to a discussion of US military strategy.

During World War 2 we had a War Department (Army) and a Department of Navy, which also includes the Marines. The Air Force was later split off from the Army and all military branches were unified under the so-called Department of Defense. The Pentagon was built and chairmanship of the Joint Chiefs of Staff was rotated among the Army, Navy and Air Force.

With the interaction of technology and the need to integrate operations, lower-echelon "unified commands" became more common. Each theater of operations around the globe now has a Regional Commander-in-Chief over all the US military in that theater.

In 1991 the unified "Joint Strategic Command" replaced the Air Force's Strategic Air Command to control all nuclear forces. Earlier, all special operations were unified under a "Special Operations Command."

So we can see that the trend is shifting from emphasizing the specialized functions of each military branch, to integrated operations that meet the military needs of geographic regions. This chapter will trace the evolution of US military strategy through the 1980s and during the post-cold war period of the 1990s. Current US strategy will then be analyzed. Finally, what the Pentagon envisages for the 21st century will be discussed.

A. EVOLUTION OF MILITARY DOCTRINE DURING THE 1980s

The Vietnam air war and automated battlefield sparked an avalanche of military technology. Many activities which have been practiced by the military for decades had to be better defined with the advent of new sensing devices, communications methods, data processing, etc. The first attempts were specific isolated applications such as Air-Land

Battle in Europe and Constructive Engagement in Africa and Asia. As the need for closer interaction among the military branches was recognized, unified commands were set up. Finally it became apparent that the array of modern military forces is so complex that focus on long-term planning and force integration of forces was needed. To study these issues the Pentagon inaugurated The Commission on Integrated Long-Term Strategy.

1. Discriminate Deterrence.

The term "Discriminate Deterrence," coined by The Commission On Integrated Long-Term Strategy, includes a wide spectrum of responses from low-intensity conflict on the covert side to fighting a thermonuclear war on the visible end. The Commission stated in its January 1988 report:

> Our strategy must be designed for the long term, to guide force development, weapons procurement, and arms negotiations. Armaments the Pentagon chooses today will serve our forces well into the next century. Arms agreements take years to negotiate and remain in force for decades.
>
> Our strategy must also be integrated. **We should not decide in isolation questions about new technology, force structure, mobility and bases, conventional and nuclear arms, extreme threats and Third World conflicts. We need to fit together our plans and forces for a wide range of conflicts, from the lowest intensity and highest probability to the most apocalyptic and least likely.** [*Discriminate Deterrence*, p. 1 -- emphasis added]

Actually, we have seen this range of military activity over the past half-century. Immediately after World War 2, low-intensity conflict was practiced in the Philippines when the US sent military advisers to help the Filipino government counter Hukbalahap guerrillas. Later it was used to overthrow Allende in Chile, and for many other applications. The cold war hysteria, however, caused more public awareness of the nuclear aspect. More recently in the Balkans, low-intensity conflict was employed to help Iran arm the Bosnian army. The spectrum of activities is not new. But forces integration and long-term planning have taken on a new dimension.

2. Special Operations.

Each military branch has employed special operations forces for decades. US Navy special operations submarines spied on the Soviet Union and recorded sonic signatures of Soviet submarines. Others were pulled together to meet specific crises, such as the failed rescue of hostages from Iran in April 1980. The latter fiasco caused the Pentagon to set up a commission to study special operations issues. But the 1983 attack on Grenada and the 1985 hijacking of the Achille Lauro cruise liner sparked congressional interest.

On 14 November 1986 "Congress enacted Public Law 99-661, Section 1311 to revitalize special operations and correct deficiencies identified in the nation's ability to conduct special operations." [GAO/NSIAD-94-105, p. 10] The US Special Operations Command was established during April 1987. By March 1988 most special operations forces had been assigned to the Command. Public Law 99-661 mandated ten activities over which the Command would have authority:

-- **Direct Actions.** Short-duration strikes and other small-scale offensive actions to seize, destroy, or damage a specific target; or to destroy, capture, or recover designated personnel or material. (Example: the invasion of Panama to capture Manuel Noriega; sending forces to Somalia.)

-- **Special Reconnaissance.** Obtain and verify information concerning the capabilities, intentions, and activities of an actual or potential enemy; or secure data concerning meteorological, hydrological, geographic, or demographic characteristics of a particular arena. Includes target acquisition, area assessment, and post-strike reconnaissance. (Example: use of Predator unmanned aerial vehicles over Bosnia; locating Scud launchers and other targets in Iraq.)

-- **Unconventional Warfare.** A broad spectrum of military or paramilitary operations, usually of long duration, predominantly conducted by indigenous or surrogate forces that are organized, trained, equipped, supported, and directed in varying degrees by an external source. Includes guerrilla warfare, ambushes, and other direct offensive, low-visibility, covert or clandestine operations; as well as indirect subversion, sabotage, intelligence collection, and evasion or escape. (Example: helping Iran smuggle arms to Bosnia; US military retirees training Croatian and Bosnian soldiers; helping local soldiers combat drug smugglers in South America; helping peasants grow non-drug-related crops.)

-- **Foreign Internal Defense.** US special forces train, advise, and otherwise assist host nation military and paramilitary forces. (Example: helping to train Arab troops; training Bosnian officers under the US "Train and Equip" program.)

-- **Counterterrorism.** Application of highly-specialized capabilities to fight terrorism abroad; including hostage rescue, recovery of sensitive material, and direct action against terrorist infrastructure. (Example: the US F-111 raid on Libya; firing Tomahawk cruise missiles at Iraq in retaliation for an assassination plot against ex-President Bush.)

-- **Civil Affairs Operations.** To establish, maintain, influence, or strengthen relations between US and allied military forces, civil authorities, and people in friendly or occupied country/area. (Example: dispatching troops to California to help quell the Los Angeles riot after the Rodney King verdict.)

-- **Psychological Operations.** To support other military operations and actions to favorably influence the emotions, attitudes, and behavior of a foreign audience on behalf of US interests. (Example: mass media techniques.)

-- **Humanitarian Assistance**. Conducted to supplement the efforts of host nation authorities in relieving or reducing the results of natural or man-made disasters, or other endemic conditions such as human pain, disease, hunger, or privation that might present a serious threat to life or loss of property. (Example: helping African governments control epidemics, reduce industrial pollution, and conserve natural resources; teaching Cambodians and Afghans to clear mine fields; assisting at domestic and foreign natural disasters.)

-- **Theater Search and Rescue**. To recover distressed personnel during wartime or contingency operations. (Example: rescue of the downed F-16 pilot in Bosnia.)

-- **Other Activities**. As specified by the President or Secretary of Defense. These could include actions against manufacturing plants for chemical-biological-nuclear weapons, information warfare, counter-drug activities, countermine activities, security assistance, and more. (Example: coordinating western and Arab troops preparing for war in Kuwait, sending US troops to Haiti in 1994 to prepare country for UN peacekeepers; combating domestic drug running.)

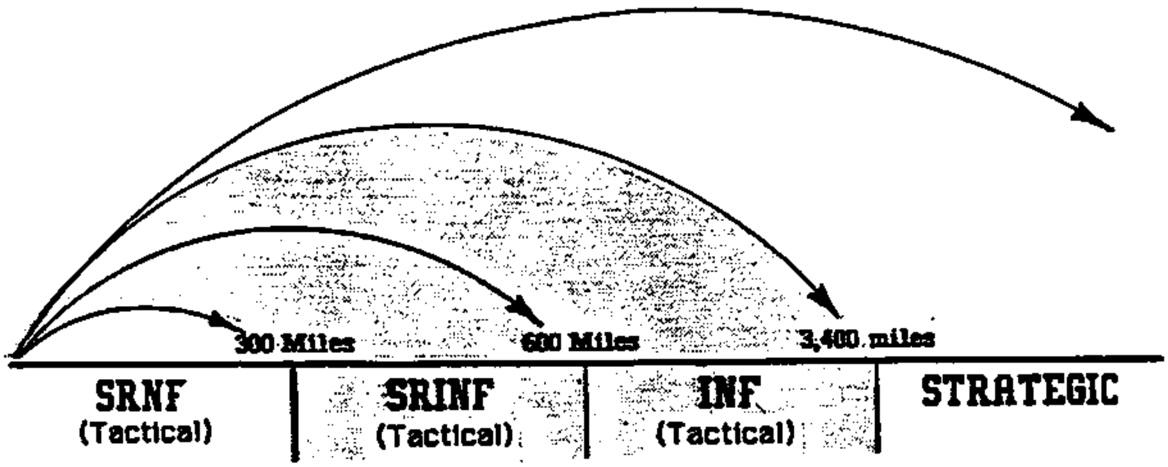
Pentagon reluctant to implement all of the Congressional mandate prompted new legislation. Public Law 100-180, enacted in December 1987, directed the Defense Secretary to provide adequate resources for the Special Operations Command; and established a "Major Force Program-11" budget category for special operations. Public Law 100-456, Section 712 made the Special Operations Command responsible for submitting budget proposals and program recommendations, and for exercising authority over its budget.

Special operations forces are specially trained over the spectrum of their responsibilities to conduct operations in worldwide support of the five US regional commanders-in chief, American ambassadors, and other government agencies. The Command's headquarters is at MacDill Air Force Base in Florida. There are three service components: the Army Special Operations Command at Fort Bragg, North Carolina; the Naval Special Warfare Command at the Naval Amphibious Base, Coronado, California; and the Air Force Special Operations Command at Hurlburt Field, Florida. Also at Fort Bragg, North Carolina is a sub-unified Joint Special Operations Command. The Special Operations Command's annual budget exceeds $3 billion and its personnel exceeded 48,000.

The Command has already ordered 55 CV-22 tiltrotor cargo aircraft adapted to special operations from the Marine Corps V-22 Osprey, 24 MC-130 Combat Talon II transport aircraft, and 13 specially modified C-130 aircraft with rapid-fire guns and precision sensors. Procurement from now to the end of the decade will be for small ships and miniature submarines designed for special operations. The Command is also interested in the Army's "21st Century Land Warrior" program to give the individual soldiers advanced computers and displays, sensors, advanced weaponry, and protective armor.

The Special Operations Command deserves close scrutiny because, as will be seen below, it could be the precursor of 21st Century warfighting strategy.

FIGURE 1.2-1
NUCLEAR WEAPONS CLASSIFICATIONS



INF -- Intermediate-range Nuclear Forces
SRINF -- Short-Range INF
SRNF -- Short-Range Nuclear Forces

Tactical nuclear weapons are designed for use in a theater of operationas (regional war).
Land-based INF and SRINF have been removed by the INF Treaty.
Stretegic nuclear weapons are designed for total thermonuclear war between superpowers.
Strategic weapons are restricted by the START-1 and START-2 Treaties.

B. SHIFTING EMPHASIS DURING THE 1990s

Although discriminate deterrence covers a wide spectrum of military activities, focus on specific areas of the spectrum may shift as world conditions change. It is the purpose of force integration and long-term planning to make these shifts smoothly and timely. With the end of the cold war a shift in focus was mandated when President George Bush announced a "new world order."

1. The Reed Panel.

After the aborted Moscow coup during August 1991, Air Force General Lee Butler, director of US nuclear targeting, convened the Joint Strategic Target Planning Staff Advisory Group, composed of 21 nuclear experts from the Carter, Reagan and Bush administrations and chaired by Thomas Reed, Air Force Secretary under President Reagan. The Reed panel, as it was called, issued a 44-page secret report which was leaked to the *Washington Post.* It proposed a "comprehensive nuclear targeting plan for the post-Cold-War era," which has been described as the most sweeping revision of US strategic targeting since the dawn of the nuclear age. [*Mercury News*, 6 Jan 92, p. 14A]

a. Halve the Strategic Triad. The Reed panel recommended that the administration cut strategic warheads to about 5,000 -- a level substantially below what is allowed by the START-1 Treaty. This, the panel contended, would be enough to deter a massive attack by Third World countries and former Soviet republics, and would still bolster America's world-leadership status. Further cuts in the future may be in order but the panel warned that US inventories should always be larger than those of Britain, France, and China combined. The Reed panel calls for this strategic warhead reserve to be used as needed.

b. **Cover All the Bases.** The Reed panel also suggested that a set of plans be drafted to mount strikes against "every reasonable adversary" with either nuclear or conventional weapons. [*Mercury News*, 6 Jan 92, pp. 1A & 14A] Contrary to the traditional public thinking that nuclear weapons are only to deter a nuclear attack, the Reed panel added several other purposes:

-- **Preserve US prestige and dissuade nuclear proliferation.** Maintaining a substantial number of strategic nuclear weapons will aid in maintaining US prestige and prevent other countries, such as Germany and Japan, from developing nuclear arsenals.

-- **Rethink the 1979 pledge.** It may be necessary to depart from the promise not to use nuclear arms against non-nuclear countries. The Reed panel predicted that America will have to use strategic nuclear arms more and more to deter use of chemical or biological weapons by smaller countries, or other hostile actions by those countries.

-- **Protect America's Interests.** In his briefing to the nuclear targeting director, Reed said the US "must keep nuclear weapons to protect its fundamental interests ... (including) a healthy and growing US economy. If the United States moves from superpower to being an equal, others may decide to become equals as well." Reed said that American arms could deter annihilation of states such as Israel and Taiwan, the seizure of critical raw materials such as oil, or foreign domination of a segment of space. [*Mercury News*, 6 Jan 92, p. 14A]

-- **Create a Nuclear Expeditionary Force.** To fulfill all of the above, the Reed panel recommended establishing a nuclear expeditionary force armed with a few strategic air-launched and submarine-launched weapons, as well as tactical nukes. In his briefing, Reed said this force would be primarily for use against China and Third World countries. This means that strategic bombers and Trident submarines designed for total thermonuclear war are to be given a tactical role in regional wars.

2. The Bush Initiatives: Trimming the Fat.

Prior to the Reed Panel's recommendations there had been moderate headway in removing obsolete and defective nuclear weapons in both the tactical and strategic areas. The INF Treaty eliminated ground-based intermediate-range tactical nuclear missiles. The START-1 Treaty, signed during the sunset days of the Soviet empire, removes old, obsolete strategic weapons and does nothing to prevent a US first-strike capability. The four former Soviet countries which had strategic weapons eventually ratified START-1, which is described more fully in Appendix-G.

a. Bush's September Initiatives. In the wake of the INF and START-1 Treaties President Bush progressively implemented the Reed panel's doctrine. On 27 September 1991 he announced several "unilateral" cuts in accordance with the Reed panel recommendations.

-- **Withdraw and destroy all remaining ground-based tactical nuclear weapons worldwide.** That involves 850 Lance missiles and some 1300 nuclear artillery shells. But that does not make Europe nuclear-free. Remaining are some 900-1,300 nuclear gravity bombs which can be delivered by fighter aircraft.

-- **Remove all Navy tactical nuclear weapons.** Depth charges will be destroyed but nuclear Tomahawk cruise missiles and bombs will join others in storage to make a stockpile of some 500 nuclear Tomahawks and over 1000 nuclear bombs. They could easily go to sea again.

-- **Take strategic bombers off 24-hour strip alert.** Air-Launched Cruise Missiles (ALCMs) and Short-Range Attack Missiles (SRAMs) will be stored and still available.

-- **Remove from alert all silo-based missiles scheduled to be dismantled under START-1.** This involves 450 Minuteman-2 missiles for which common sense and budget restraints dictated removal anyway.

-- **Cancel the follow-on nuclear short-range attack missile (SRAM-2).** This program was hopelessly mired in development problems.

-- **Drop plans for a rail-mobile MX missile.** Again a common-sense and cost-savings move because after 20 years of study a secure mobile mode has not been found.

Soviet President Mikhail Gorbachev agreed to match US reductions. However, all of the affected weapons were already built or in serious difficulty, and promised no further profit for military contractors. Neither did they play a useful part in the Reed panel's doctrine. As Under Secretary of Defense Paul Wolfowitz admitted, "the main thrust of this initiative is to get rid of weapons that are no longer necessary." [PCDS Briefing Paper, "The Bush and Gorbachev Nuclear Arms Cuts Proposals"]

Along with his September 1991 initiatives, President Bush also announced formation of the new Joint Strategic Command (StratCom) to replace the Air Force's Strategic Air Command to control all nuclear forces. The commander-in-chief of StratCom will rotate every two years or so between a Navy admiral and an Air Force general. This provides the command structure to carry out the Reed Panel formula for both strategic and tactical nuclear weapons.

b. State-of-the-Union Concessions. The USSR finally collapsed in December 1991 and the CIS emerged. During his 28 January 1992 State-of-the-Union Address resident Bush announced more "unilateral" cuts:

-- **Halt B-2 bomber production at 20 planes.** Congress had for three years refused to fund more than 15. Bush squeezed in five more planes.

-- **Cancel the small ICBM -- "Midgetman."** The Pentagon has never wanted this missile. Midgetman was mandated by Congress.

-- **Cease production of warheads for sea-based missiles.** The Mark-5/W-88, 475-kiloton warhead for Trident-2 was in production, and it was at a standstill due to warhead safety problems and serious production problems at Rocky Flat.

-- **Cease production of MX missiles.** Congress had already refused to fund more silo-bases MXs and the rail-mobile scheme was gone.

-- **Cease production of advanced cruise missiles.** 461 of the planned 1,000 were produced. The trend toward highly accurate conventional weapons, obviated the need for advanced cruise missiles.

Again, only troubled, obsolete, or unneeded programs were stopped. And the US nuclear inventory came closer to the Reed Panel's model.

c. **Bush Challenges Yeltsin.** President Bush then said during his State-of-the-Union speech: "I have informed President [Boris] Yeltsin that if the Commonwealth [of Independent States] will eliminate all land-based, multiple-warhead ballistic missiles, I will do the following:... eliminate all [MX] missiles.... reduce the number of warheads on Minuteman missiles to one,... and reduce the number of warheads on our sea-based missiles by about one-third. And we will convert a substantial portion of our strategic bombers to primarily conventional use...." [*Mercury News*, 29 Jan 92, p. 10A] Let us examine these one at a time.

-- **Eliminate all MX missiles.** The existing fifty carry 500 Mark-21/W-87, 330-kiloton warheads, which meet all safety requirements and can be installed one-each on the 500 Minuteman-3 silo-based missiles. Besides enhancing safety, this is a good tradeoff for having the CIS eliminate multiple warheads on their strongest, most reliable, and most accurate strategic weapons. In addition, with the Russian land-based ICBMs removed, no one could perceive a need for so many US warheads.

-- **Reduce warheads on Minuteman missiles to one.** Eliminates unsafe warheads and arms Minuteman-3s with MX warheads. Again a good tradeoff as the CIS would be weakening the strongest leg of its strategic triad.

-- **Reduce warheads on sea-based missiles by about one-third.** That was the first time mention has ever been made of reducing the Trident capability. The best way to do that is to also cut the number of submarines and missiles.

-- **Convert a substantial portion of the strategic bombers to primarily conventional roles.** With their weapons removed, these bombers are now essentially in storage. Converting most of them to conventional use fits the Reed panel doctrine for regional wars.

d. **Yeltsin Calls Bush's Hand.** Russian President Yeltsin immediately met Bush's bid and raised the ante -- cut strategic warheads to somewhere between 2,000 and 2,500. This led to signing the START-2 Treaty which is described in Appendix-G.

3. Regional Scenarios: Seven Wonders of the Pentagon World.

Classified documents calling attention to frightening war-planning considerations were anonymously leaked to the *New York Times* in February 1992. They proposed seven scenarios for US military activities during the next decade.

-- Another war with Iraq.

-- War with North Korea.

-- Simultaneous wars with both Iraq and North Korea.

-- A resurgent Russia launching a major military offensive against the Balkan States.

-- A coup in the Philippines endangering US citizens.

-- A narcotics terrorist plot against the government of Panama.

-- The emergence of a new rival superpower.

Pentagon officials confirmed existence of the documents but, when pressed for more details on the military threats, Defense Secretary Cheney said: "I think I need for diplomatic reasons, if no other, to avoid specifying individual nations." [*Mercury News*, 18 Feb 92] Nevertheless, this planning fits well into the Reed Panel's suggested doctrine.

When Senator Sam Nunn, then Armed Services Committee chairman, asked why these top-level documents were not made available to his committee, then Vice-Chairman of the Joint Chiefs of Staff, Admiral David Jeremiah, said they were classified. It is frightening when a congressional committee, whose constitutional purpose is to oversee the Pentagon budget, and which is authorized to go into executive session to hear classified information, is denied that information. Such denial puts democratic processes on hold.

4. The Pentagon's Bottom-Up Review.

As the first Secretary of Defense in the Clinton administration, Les Aspin, vacillated on whether the US should be able to fight two wars simultaneously or one at a time. In October 1993 he ordered a comprehensive review of America's nuclear strategy from the bottom up -- not just strategic weapons but also tactical; not just targeting but also the threat from terrorism, renegade nations, and nuclear proliferation; not just to deter a nuclear threat but also chemical and biological weapons of mass destruction. The review would consider the size of the nuclear arsenal as well as how it is deployed.

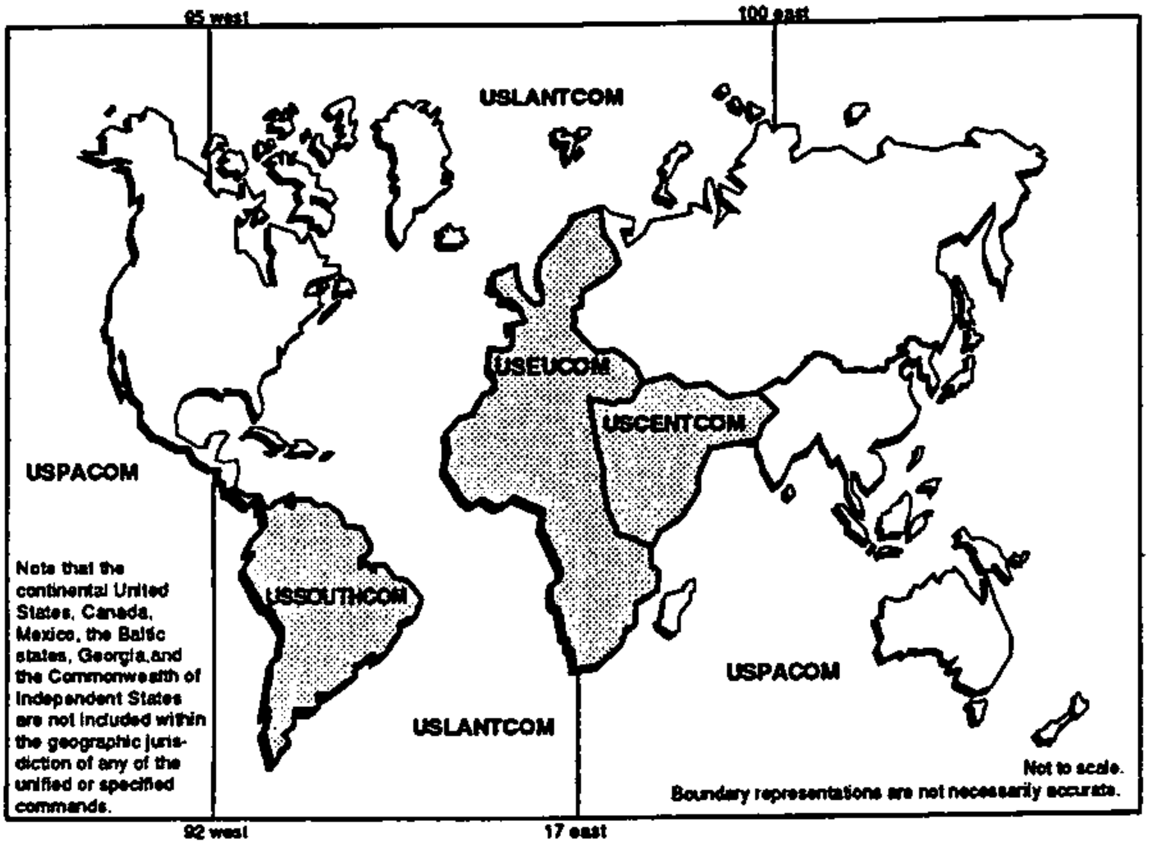
The Bottom-Up Review, completed in early 1994, upheld the requirement to be able to fight two regional wars almost simultaneously. It also addressed the requirements for intervention in smaller conflicts or crises, and forces deployed overseas.

Congress became concerned that the Pentagon had not fully examined the Bottom-Up Review assumptions and attached a rider to the fiscal year 1995 Pentagon budget directing the Secretary of Defense to do so. He was to report back to Congress in May 1995.

FIGURE 1.2-2

U.S. REGIONAL COMMANDS -- 1992

Source: JMNA-1992, p. 44



USCENTCOM --US Central Command
USEUCOM -- US European Command
USLANTCOM -- US Atlantic Command
USPACOM -- US Pacific Command
USSOUTHCOM -- US Southern Command

Changes to the geographic areas depicted which resulted from the Bottom-Up Review:

- -- In early 1966 the waters adjoining Central and South America were transferred from the US Atlantic Command to the US Southern Command.
- -- In early 1996 large portions of the Arabian Sea and Indian Ocean were transferred from the US Pacific Command to the US Central Command.
- -- Some time after 1 June 1997 the Carribean Sea, the Gulf of Mexico, and an additional portion of the Atlantic Ocean will be transferred to the US Southern Command.

5. Commission on Roles and Missions.

This congressional mandate led to an "independent" Commission on Roles and Missions of the US Armed Forces to sort out the various military functions and define who is responsible for them. The Commission's final report, *Directions For Defense*, was delivered to Congress and the Pentagon in May 1995.

Early on, the Commission decided to focus on the regional commanders-in-chief needs to carry out joint operations and various support activities -- not on the capabilities of the individual branches of the military. The result was several proposals to improve joint military operations along with suggesting that more of the support work be contracted to private businesses.

The Commission made over a hundred specific suggestions, the core of which is being implemented by the Pentagon along four lines: being prepared for joint military strikes, having the forces and equipment to strike, and ensuring force modernization and efficient support structures.

a. **Being Prepared for Joint Military Strikes.** In early 1996 the Joint Chiefs of Staff Chairman published *Joint Vision 2010* (see below) expressing his thinking on joint operations. More emphasis was assigned to modeling and simulation capabilities at the Joint Warfighting Center in Norfolk, Virginia. Likewise for the Pentagon's Joint Training, Analysis, and Simulation Center. Another center was established with the sophisticated name of Joint Command, Control, Communications Computers, Intelligence, Surveillance, and Reconnaissance Battle Center. Accordingly, global boundary lines of the US commands are being redrawn for better regional-war efficiency.

Regarding equipment, steps are being taken to make aerial refueling tanker aircraft and electronic warfare aircraft interoperable with US allies and coalition partners. Likewise for uniformity in air-support for ground troops and surface ships.

b. **Having the Forces and Equipment to Strike.** Current activities are in the study mode. One study is of deep-attack systems -- the appropriate mix of weapons; timely and effective command, control, communications, computers, and intelligence (C^4I) architecture; procedures for integrating and employing deep-attack systems; and determining the adequate force structure and weapons tradeoffs.

One special Integrated Task Force was established in October 1995 to develop this C^4I architecture. Another special Pentagon task force is reviewing the size, organization, and responsibilities of reserve units; insuring that they perform to adequate standards; and that they are effectively integrated with the active forces.

c. **Ensuring Force Modernization and Efficient Support Structures.** Several but not all of the Commission's suggestions are being pursued here. Throughout 1996 a Pentagon-wide Integrated Process Team will identify which functions can be contracted to commercial firms, while eliminating obstacles to and developing strategies for such contracting. Along a parallel line, streamlining the logistical support is also underway. Finally, the Defense Secretary's office will issue a policy memorandum to consolidate and co-locate the procurement offices of joint and closely-related aircraft programs.

C. THE NUANCES OF CURRENT U.S. STRATEGY

In Chapter One of his 1996 report to the President and Congress, Defense Secretary William Perry outlines US strategy. Overarching everything is the National Security Strategy which is global in scope. Sub-headed under that are the Regional Security Strategies. Enforcing the National Security Strategy is the role of National Military Strategy.

1. U.S. National Security Strategy.

"To protect and advance US interests, the American government must be able to shape the international environment, influencing the policies and actions of others." [Perry-1996, p. 2] As we saw in Chapter 1.1, US interests are really big business interests. In Perry's words, the essence of national security is to manipulate the world order to benefit those interests. To accomplish that the US must have its fingers in many pies.

Thus the US National Security Strategy is called one of engagement and enlargement -- **engagement** abroad in the areas of greatest economic interests while encouraging allies and friends to pick up part of the tab; and **enlarging** global free-market enterprises in which the United States is a master at competing. Perry itemizes the three strands of US National Security Strategy which can be translated as follows:

- Enhance US security through a strong military and by cooperative security agreements.
- Promote US prosperity by creating global free trade -- the activity, in which the US excels, that maximizes corporate profits.
- Protect, consolidate and enlarge the global community of "free-market democracies" -- the authoritarian governments in which cheap labor and exploitative trade can flourish. One instrument used is the International Military Education and Training program to help newly "democratic" countries to establish civilian-military relationships.

National Security Strategy is the broad brush stroke. It is fine-tuned for the various global regions.

2. U.S. Regional Security Strategies.

Each region of the world has unique conditions to which US strategy must adapt, and its special combination of security treaties and free-trade agreements. Defense Secretary Perry states: "The security relationships established by the United States and its allies and friends during the Cold War are essential to advancing America's post-Cold War agenda. To meet the unique challenges of the post-Cold War era, the United States seeks to further strengthen and adapt those partnerships and to establish new security relationships in support of US interests. [Perry-1996, p. 3] Chapter 1.1 has already outlined "America's post-Cold War agenda" and "US interests." Let us look at how the US strategy is applied to the various regions.

a. **Europe.** America's foothold in Europe is the North Atlantic Treaty Organization (NATO). Since the end of the cold war it has been hard to justify NATO's function and the US has pushed to extend NATO's influence in two main ways. First, NATO has instituted a Partnership for Peace program to encompass central and southeastern European countries -- mostly countries which were formerly part of the Soviet bloc. Second, NATO has changed its rules to authorize out-of-area operations, such as the Implementation Force (IFOR) in Bosnia and Herzegovina.

Both of these measures have alienated Russia, undermined the goodwill which has sparked the START Treaties, and bolstered the influence of Russian hardliners. In short, NATO activities are moving the world closer to another cold war.

b. **East Asia-Pacific.** This region is experiencing such unprecedented economic growth that the 21st century has been dubbed "The Century of the Pacific." That is why the US is so keen about the Asian-Pacific Economic Conference. Asia is also an area where oppression and forced labor run rampant. That is why the strategy of "Constructive Engagement" is practiced.

Constructive Engagement is the means by which human rights violations can be overlooked when they interfere with profits. It states that the US doesn't condone human rights violations, but neither is it going to restrict its trade policy because of a single issue. But it is a different story when the issue is China pirating software and other electronic copyrights which hurts American businesses. Even then the administration has to study which Chinese imports to levy sanctions against -- it must be careful not to jeopardize the cheap forced labor US firms enjoy in that country.

A companion strategy in the East Asia-Pacific region is "Preventive Defense." This is practiced by security agreements such as those with Japan and South Korea, confidence-building measures such as joint exercises in the Pacific, and other agreements such as the one which persuaded North Korea to stop its nuclear weapons program.

c. **Middle East.** US interests in this region are obviously oil and arms sales. Any threat to the free flow of oil is met with an immediate and decisive military response, as illustrated by the war with Iraq. Toward enhancing the free flow of oil the US has vigorously pursued a Mid-East peace plan. Under the guise of enforcing peace the US has established a huge arms market in both Israel and friendly Arab states.

d. **South Asia.** The main strategy here is to establish defense relationships which will prevent a major India-Pakistan encounter. Stability in the region is essential to developing economic interests there and in adjoining areas.

e. **Western Hemisphere**. The overarching US objective in this region is to sustain military and economic stability. This is necessary in order to extend the North American Free Trade Agreement to other Central and South American countries.

f. **Africa**. The US presently has no significant or permanent presence in Africa. But the US does have significant interests in countering state-sponsored terrorism, drug trafficking, and proliferation of weapons and weapons technology -- particularly weapons of mass destruction such as chemical weapons in Libya.

Africa also has potential for developing free-market economies. Toward that end the US is seeking to "empower" African states and organizations so they can resolve their many conflicts. Again the door is open for weapons sales and military advisers.

3. U.S. Military Strategy.

Defense Secretary Perry pointed out that "the Department of Defense will field and sustain the military capabilities needed to protect the United States and advance its interests. The United States is the only nation capable of unilaterally conducting effective, large-scale military operations far beyond its borders." [Perry-1996, p. 4] Perry lists the most prominent of threats to US interests:

-- Attempts by hostile powers to gain hegemony in their regions through aggression or intimidation.
-- Internal conflicts among various groups that threaten innocent lives, force mass migration, and undermine stability and international order.
-- Threats by potential adversaries to acquire or use weapons of mass destruction (nuclear, chemical or biological) and their delivery systems.
-- Threats to democracy and reform in the former USSR, Central and Eastern Europe, and elsewhere.
-- Subversion and lawlessness that undermine friendly governments.
-- Terrorism.
-- Threats to US property and economic growth.
-- Global environmental degradation.
-- The illegal drug trade.
-- International crime.

To counter these threats and support the National Security Strategy of Engagement and Enlargement, the Pentagon has integrated the Reed Panel recommendations, the Seven Wonders of the Pentagon World, and the recommendations of the Bottom-Up Review into four complementary military missions: (a) ability to fight and win two regional wars almost simultaneously, (b) forward deployment of troops and supplies, (c) contingency operations, and (d) countering the spread of weapons of mass destruction. We shall look at them one at a time.

a. **Ability To Fight And Win Two Regional Wars Almost Simultaneously**. It is hoped that flaunting US military strength will deter any regional dictator from stepping out of bounds. But if that fails the US is capable, through security treaties or just plain economic might, to bring its allies into a coalition aimed at decisively and quickly defeating that dictator.

Then the strategy calls for providing post-war stability. Unfortunately, that stability only works one way, as the sanctions on Iraq after the Persian Gulf war illustrate. Hundreds of elderly, women, and children are dying from lack of basic needs, but the sanctions which cause this keep Saddam Hussein from interfering with Big Oil.

According to military strategy the US must have the military power and commitment from allies to carry on two major operations of this type nearly simultaneously. The nuclear expeditionary force recommended by the Reed Panel certainly factors into that capability, as does the tactical Trident of the US ally, Britain.

b. **Forward Deployment Of Troops And Supplies.** In order to carry out that first mission, US troops and supplies must be immediately available. Although the US has cut down considerably on overseas bases, there are still about 100,000 fully-equipped US troops in the Asia-Pacific region and about 109,000 in Europe.

An Army heavy-brigade set of equipment is prepositioned in Kuwait. A heavy brigade set is also being established in South Korea and another is planned for Southwest Asia. In Qatar a heavy brigade and division base is being set up which includes a tank battalion set of equipment. Still another heavy brigade set is afloat in six merchant ships near Indonesia. They can be immediately dispatched to Korea or the Persian Gulf with 15 days supply of everything from tanks to bandages. The Army also has two container ships carrying a 30-day supply for early use of the entire contingency corps.

Air Force planes are deployed at critical locations along with stocks of the preferred munitions for their area. Three ammunition ships are being modernized to supply the Air Force early in conflict.

Naval carrier task forces, Marine Expeditionary Units (special operations capable), along with Tomahawk-capable ships and submarines are sent to potential trouble spots. To support the Marine units for 30 days are three squadrons (13 ships total and growing) of maritime prepositioning ships in the Mediterranean Sea, Indian Ocean, and the Western Pacific.

It was this prepositioning that allowed the US to respond so quickly in October 1994 when Iraqi units massed on the Kuwait border.

c. **Contingency Operations.** Contingency operations fall between peacetime forward deployment and full-scale regional war. Examples are:

-- **Smaller-scale Combat Operations** such as enforcing the no-fly zone over Iraq.

-- **Peace Operations** have two prominent types: "Peacekeeping," such as in Bosnia and Herzegovina where all major belligerent parties consent to preserving or maintaining the peace; and "Peace Enforcement" to compel compliance with resolutions or sanctions and do not require the consent of belligerents. Peace operations also include observer missions such as in the Sinai and in the border region between Peru and Ecuador during 1995; and training the staff for UN operations such as in Haiti and Angola, which began in 1995.

-- **Other Key Missions** is a catch-all category to pick up other non-traditional uses of the military. These missions include: "humanitarian and refugee assistance" both foreign and domestic; "combating terrorism" which includes striking suspected terrorist bases in other countries; "noncombatant evacuation operations" such as removing Americans from Liberia in 1990, from Somalia in 1990, from the Philippines after the eruption of Mount Pinatubo in 1991, and Rwanda in 1994; and "counter-drug operations" which began in September 1989.

d. **Counterproliferation Initiative.** This mission was launched in December 1993, pursuant to a presidential directive, to address the spread of nuclear, biological, and chemical weapons. Besides the five declared nuclear powers, the Pentagon estimates that at least 20 other nations have or are attempting to acquire nuclear, chemical or biological weapons, along with the means to deliver them. The Pentagon outlines seven areas in which it approaches this mission:

-- **Deterrence.** By continually estimating the intentions of a country possessing nuclear, chemical, or biological weapons the US adopts declared policy, force structure and other political/diplomatic/military signals that would intimidate an aggressor.

-- **Intelligence.** Continually spying on suspicious countries and assessing their threat. For example, US Navy patrol planes in the Middle East carry a Specific Emitter Identifier to identify and track ships carrying nuclear, biological or chemical cargoes.

-- **Missile Defense.** Ability to prevent or limit contamination by any cruise missile or ballistic missile which might be carrying nuclear, biological, or chemical weapons.

-- **Passive Defenses.** Battlefield devices to detect, protect against, and decontaminate from chemical or biological weapons.

-- **Counterforce.** The ability to seize, disable, or destroy arsenals of nuclear, chemical, or biological weapons -- or their delivery system -- prior to use without "unacceptable collateral damage" (meaning civilian deaths which cannot be covered up). An example is the underground chemical munition plant in Libya which may soon be attacked. Also on the high-priority list to watch are Iran, Iraq, and North Korea.

-- **Effective Power Projection.** Basically this means to keep US troops out of areas where nuclear, chemical, or biological weapons might be used.

-- **Defense Against Covert Threats.** Seek capabilities to detect and disarm nuclear, chemical, or biological weapons that may be smuggled into the US.

The ultimate weapon to back up these military missions is America's nuclear bomb. Commanding Admiral Henry Chiles of the US Strategic Command, which controls all the US nuclear forces, said in mid-1995 that his forces deter attacks "from any direction, not just from Russia, in an era of weapons of mass destruction." He referred to nuclear weapons as "blunt instruments of last resort" which allow the President to deal from strength, and added: "We're... America's insurance policy." [Cited in *Mercury News*, 1 June 1995, p. 12A]

D. PLANS FOR THE 21st CENTURY

Two concepts are emerging to cause serious rethinking on how to conduct a war. First of these is long-range, precision-strike weapons coupled with sophisticated sensors and very effective command and control systems to destroy the enemy from a distance. The second is information warfare.

1. Joint Vision 2010.

In early 1995 the Pentagon set up five "Revolution in Military Affairs" task groups to study warfighting after 2010. Their studies suggested smaller, highly mobile, better dispersed, and very lethal military units. Using advanced communications these units could call for precision missile or aircraft strikes to help subdue their opponent. These forces would strike deep into enemy territory to destroy missile emplacements, munitions storage, transportation devices, communications, etc.

To shape the military force structure, equipment, and tactics called for by the Revolution in Military Affairs task groups, the Pentagon in early 1996 announced a new strategy called "Joint Vision 2010." This strategic plan rests on four key pillars: Dominant Maneuver, Precision Engagement, Focused Logistics, and Full Dimension Protection.

a. **Dominant Maneuver**. Allows dispersed land, sea, air, and space forces to control all aspects of the battle and accomplish their mission. Dominant Maneuver will build on joint operations from widely scattered locations.

b. **Precision Engagement**. Provides the proper mix of forces and weapons to rapidly engage or destroy the enemy at long range. Joint commands and flexibility are the key.

c. **Focused Logistics**. Integrates information-gathering technologies and transportation techniques. Requires rapid tracking and shifting of supplies to keep highly mobile and dispersed forces equipped.

d. **Full Dimension Protection**. Provides the full spectrum of capabilities needed to protect all US forces, assets, and facilities so that complete superiority over the battlefield can be achieved.

The Pentagon admits they do not have these capabilities now, but intend to achieve them. Additional personnel and funding has been poured into the Joint Warfighting Center at Fort Monroe, Virginia to run war games, simulation exercises, and live exercises that will flesh out the strategy and needs of "Joint Vision 2010." The US Defense Science Board is funding studies of 21st century warfare and the logistics needed to support it. Computer simulations such as TACWAR and NIMBLE DANCER are refining methods to fight two wars nearly simultaneously.. Broad technology concepts will be refined by the Pentagon's Advanced Concepts Demonstration Program. And military commanders will be retrained to think of small, precise, surgical operations rather than massively overwhelming the enemy.

Army plans are to have sensor-clad super warriors which can monitor everything on the battlefield. The Air Force is moving toward pilotless fighter planes. And the Navy envisions unmanned and minimally-manned vessels such as the arsenal ship. All of this will be made possible through enhanced communications and Information Warfare.

2. Information Warfare.

The official definition of information warfare is secret but it is usually described as protecting one's own information-gathering systems while destroying or disrupting the opponent's. Some say that harnessing concepts into useable tools will create a revolution in military thinking, and they view information warfare as a means to overcome an enemy without firing a shot. Others say information warfare is merely a refinement of intelligence-gathering, electronic warfare, psychological operations, security, cryptography and deception. Nevertheless, research and development funding in this area has tripled in five years and the Air Force Rome Laboratory in New York has formed a team to focus on information warfare implications.

The more exotic concepts of information warfare envision enemy commanders in underground bunkers watching their forces advance victoriously on the battlefield, while in fact those forces were really routed during the early stages of combat. Those commanders had been led into all the wrong decision by bogus information.

E. CONCLUSION

During the Persian Gulf war, we fell victim to an intense propaganda campaign fabricated from deception and falsehood. Yellow ribbons and patriotic banners flew from many door posts. Today we are taken in by more subtle but equally convincing mind control -- the delusion that the nuclear menace is gone and that the world is in good repair. Nothing could be more wrong.

The military solution from Korea to Bosnia, from Panama to Somalia, has consistently failed. Some of those conflicts were eventually stopped by political solutions which could have occurred much sooner. The war with Iraq is still awaiting that solution.

Joint Vision 2010 is really the same progression of channeled vision down the neanderthal path of military thinking. Real vision must take in a wider field of choices which will lead to a benevolent mutation in the evolution of world order.

* * * * *

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SECTION 2
THE TRIDENT
SUBMARINE AND MISSILE
SYSTEM

2.1 TRIDENT SUBMARINES: MOBILE MISSILE SILOS

In 1967 the US Department of Defense engaged the Institute for Defense Analysis to study all the options for modernizing the strategic triad of nuclear force -- silo-based intercontinental ballistic missiles (ICBMs) on the ground, bombers and bomber-launched nuclear weapons in the air, and submarine-launched ballistic missiles (SLBMs) at sea. This investigation was called Strategic Exercise Study X (Strat-X). In 1968 the Underwater Long-range Missile System (ULMS) emerged as the modification for the sea leg of the triad.

ULMS was later called Trident and in 1970 studies were underway to determine how many warheads of various explosive power would fit onto each missile. It may surprise many that the first Trident concept was the Trident-2, or D-5 as it is also known.

Lockheed and the Navy apparently recognized that the huge D-5, which requires a new submarine, was years away, and something had to be done in the meantime to keep the business going. In 1972 a task force was organized to conceptualize a longer-range version of the current Poseidon C-3 missile, which would be designated C-4. On this Extended-range Poseidon (EXPO) task force, as it was called, only existing or very-near-term technology was considered.

After several months a manual was compiled containing options identified during the EXPO exercise, presuming the Navy would immediately request funding from Congress. But the Navy shelved the report, reasoning that the much-cheaper C-4 which would fit into existing submarines might influence Congress to delay the new Trident submarine program.

Only when Trident submarine construction was well underway did Navy officials dust off the EXPO report to advise legislators that developing D-5 missiles and building new submarines would consume years. Those officials then introduced the C-4 proposal as an interim modernization. C-4 became known as Trident-1. That automatically caused the D-5 to be called Trident-2. In that devious fashion the US Navy secured two missile-development projects and two submarine programs.

A. REFITTED POSEIDON BOATS

The first submarine program involved refitting twelve existing Poseidon submarines to carry Trident-1 (C-4) missiles. A later program was to build a fleet of new Trident submarines to carry the bigger Trident-2 (D-5) missiles. Prior to Trident, submarine-launched missiles were inherently less accurate than missiles launched from silos. That was because the starting point of the SLBM's trajectory was not accurately known. In order to plot missile flight path precisely to a target, one must know from where that missile starts. Missile silo locations are precisely known -- thus the accuracy of ICBMs. Submarines, on the other hand could not be positioned closer than several hundred feet, at the best. For that reason pre-Trident SLBMs were not considered to be silo-killers.

NAVSTAR satellites have removed the problem of accurately determining the submarine's position. (NAVSTAR will be discussed in Chapter 3.2) From a constellation of these navigation satellites the submarine can obtain its position within about 30-40 feet (9-12 meters) before the missiles are launched. With this technique, submarine-launched missiles achieve accuracy comparable to missiles launched from fixed silos. If the missile, itself, were equipped with a Navstar receiver, the MIRVed warheads would have even greater accuracy.

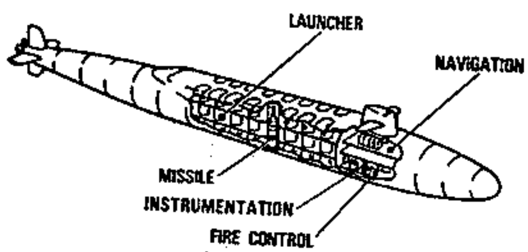

FIGURE 2.1-1
POSEIDON SUBMARINE
Source: Lockheed

There were 41 Polaris ballistic-missile-launching submarines (SSBNs) commissioned between 30 December 1959 and 1 April 1967. The first five were 380 feet long and weighed 6,700 tons. The next five were stretched to 410 feet and 7,900 tons. Then the final 31 were 425 feet (129.5 meters) long, displaced 8,250 tons submerged and 7,320 tons surfaced. All were 33 feet (10 meters) in diameter. (See Figure 2.1-1)

The newest 31 submarines were later refitted to carry Poseidon missiles. During the 1970s, 12 of those 31 were again refitted to carry Trident-1 missiles. All 41 Polaris/Poseidon submarines have now been removed from service and have been decommissioned, or are in the process of being decommissioned.

B. AMERICA'S *OHIO* CLASS

Construction was started in 1976 on the *USS Ohio*, lead ship in the new Trident fleet. (A "class" of identical ships is named after the first, or lead, ship.) These submarines carry 24 missiles each -- half again as many as Poseidon boats. The sub operates on a 100-day cycle -- 70 on patrol and 30 in port for resupply. Each cycle alternates between a gold and a blue crew. Figure 2.1-5 lists the 18 US Trident submarines planned and Figure 2.1-7 presents the US Trident submarine specifications.

There are presently sixteen Trident submarines operational, eight at Sub-Base Bangor and eight at Sub-Base Kings Bay. The schedule is to complete one submarine per year, which means the 18th and last sub will become operational in mid-1997.

It was originally planned that the first eight Trident ships, which operate out of Sub-Base Bangor, would be refitted with Trident-2 missiles during their 10-year overhaul. That has been postponed, but not cancelled: "Backfitting of the C-4 capable SSBNs with the D-5 weapons system has been deferred to 2003. [*ACIS-93*, p. 8] That is the beginning of the second and last round of one-year overhauls.

In September 1994 it was announced that the Pentagon's "Nuclear Posture Review" cut the Trident force from 18 to 14 subs. Each sub will still carry a full compliment of missiles but each missile will be loaded with five warheads instead of four. The submarines to be retired will be four of the eight oldest at Sub-Base Bangor, which carry Trident-1 (C-4) missiles. But they will be preserved in "mothballs" until the START-2

Treaty is fully implemented in 2003. The four remaining oldest subs will be refitted to carry Trident-2 (D-5) missiles. Seven submarines will then be based on each coast.

Reducing the Trident force came about because of public and congressional pressure to save money. But that does not mean the Pentagon intends to curtail nuclear submarine operations. Admiral Bruce DeMars, Director of US Navy Nuclear Propulsion pointed out to Congress that, "In the nuclear deterrent triad, the preponderance has shifted very strongly to the sea-based leg; the nuclear strategic submarines are the only ones that have not been stood down. They continue to make their patrols. And in the future, the plan is to have the majority of our country's strategic deterrent on those submarines..." [HAC-93, Part 6, pp. 1892-1893]

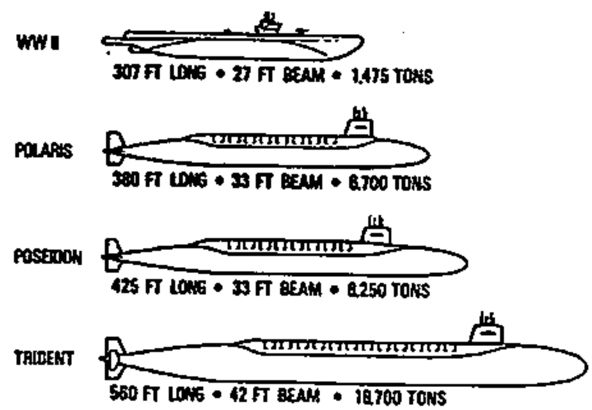

FIGURE 2.1-2
SUBMARINE COMPARISON CHART
Source: Lockheed

According to Vice Admiral Bacon, design of a follow-on nuclear-powered, ballistic missile-launching submarine (SSBN) to Trident will commence in the late 1990s. It will be smaller than Trident and carry fewer missiles with fewer warheads. [Cited in *The Sun*, 31 Oct 91, p. A10.] This is in spite of the fact that Rear Admiral Jones said before the USSR breakup, that *"the Soviets do not currently threaten US SSBNs in the open ocean, nor do we see indications of a future threat."* (Emphasis his.) [SASC-92, Part 2, p. 111.] Because US and British SSBNs only operate in the open ocean, and because any potential threat has been further diminished since the Soviet breakup, there is no military need for a follow-on submarine.

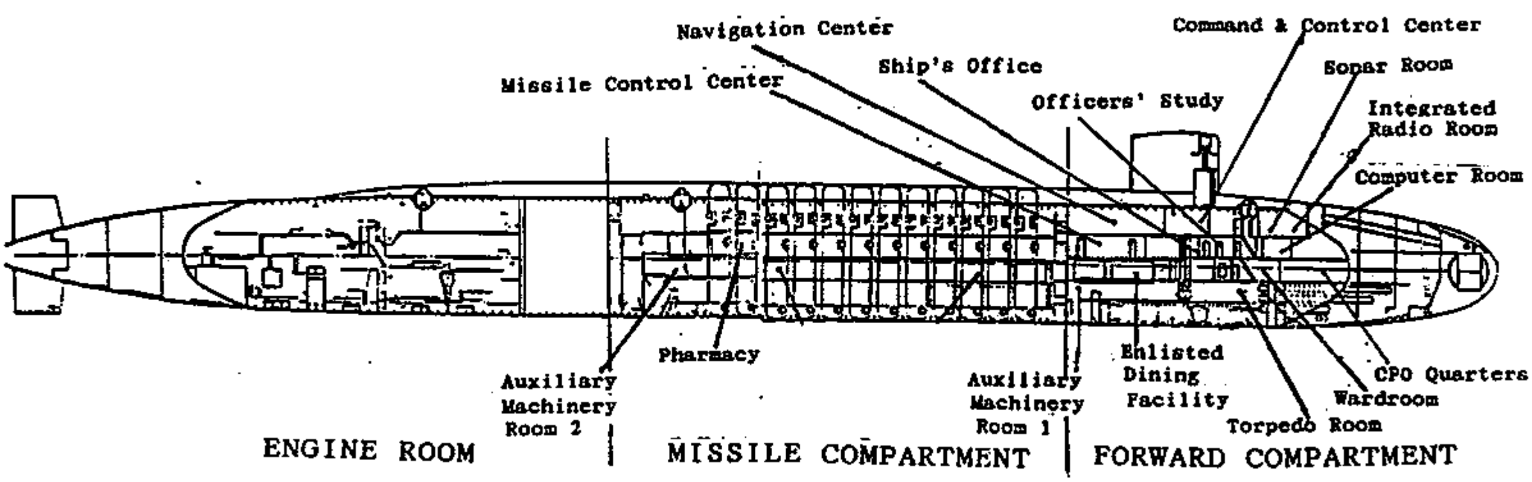

FIGURE 2.1-3
US TRIDENT SUBMARINE LAYOUT
Source: US Navy

That new SSBN program may already be underway. The US Navy is contemplating a replacement for its nuclear-powered attack submarines, designated SSNs. One option being investigated for the New SSN (NSSN) is to have a missile module that can be inserted in the middle. [*The Day*, 17 June 1995, p. 10] The first Polaris submarines were made in this fashion, by inserting a missile section between two halves of an attack sub.

C. BRITAIN'S *VANGUARD* LINE

USS George Washington, the first nuclear-powered ballistic-missile submarine became operational for the United States in 1960. It carried the first Polaris missiles, known as the A-1, which had a range of 1,200 nautical miles. Two years later, in 1962, that reach was increased to 1,500 nautical miles with the Polaris A-2. In another two years, 1964, the Polaris A-3 became operational with a range of 2,500 nautical miles. Rather than carrying one huge megaton-range bomb, it carried three 200-kiloton bombs which hit the target area in a triangular pattern to distribute the damage more "effectively."

In 1962 Britain decided to de-emphasize its strategic aircraft force and adopt Polaris missiles for the Royal Navy. Four ships of the *HMS Resolution* class were authorized in 1963. *HMS Resolution* was commissioned in October 1967, and the other three followed at approximately one-year intervals. These subs were of British design but carried the new American Polaris A-3 missiles. These missiles later carried British Chevaline warheads. (Chevaline will be discussed in a Chapter 2.3)

1. *Britain's Polaris Fleet.*

Britain's strategic nuclear arsenal presently includes two of the four original Polaris submarines carrying 16 missiles each, plus one Trident sub also loaded with 16 missiles. This force is assigned to NATO with two restrictions which nullify any real control by NATO : (a) only the British prime minister can order launch of the missiles and (b) Britain retains the right to launch the missiles without consulting with NATO officials. The four Polaris SSBNs are:

HMS Resolution

HMS Repulse

HMS Renown (decommissioned 22 October 1994)

HMS Revenge (decommissioned circa 1992)

In October 1987 *HMS Renown* started what was supposed to be a two-year refit and overhaul. The two years stretched to five. *HMS Revenge* became ready for overhaul but was retired instead of going through another refit. [HC-337, pp. xiii, 30 & 38] A persistent problem with Britain's nuclear-powered submarines seems to be cracking of the nuclear reactor [See *Cracking Under Pressure*].

2. *Britain's Trident Subs.*

In 1977 the British government set up a secret committee to determine a replacement for the Polaris fleet. That led to building a new fleet of four submarines loaded with missiles leased from the United States. The submarines were designed by the British but the center sections, where the missiles are carried, were based on the design of the *USS*

Ohio-class SSBN. Missile launch tubes for the first boat were made by Westinghouse Marine Division in the United States. The submarine's pressurized water nuclear reactor powerplant is designed to operate seven years without overhaul. The four submarines are listed in Figure 2.1-6.

The first submarine, *HMS Vanguard*, was "rolled out" of its construction hall on 4 March 1992 and slipped into the water the following day. The "naming" ceremony took place on April 30th. Contractor sea trials and Royal Navy contract acceptance trials are now complete. *HMS Vanguard* arrived at Sub-Base Kings Bay on 28 April 1994. Demonstration And Shakedown Operations (DASO) tests, during which test missiles were launched on the US Eastern (Atlantic) Test Range, began on 26 May 1994. *HMS Vanguard* went on its first patrol in international waters on 13 December 1994.

The second submarine, *HMS Victorious*, was rolled into the water early in 1994. By July 1995 the ship was at Kings Bay to fire two missiles during DASO operations. The ship went on its first patrol on 7 January 1996. CND speculates that *HMS Victorious* may assume a tactical role -- that is, each missile armed with one warhead and targeted at regional targets such as in the Persian Gulf. [CND Press Release, 25 July 1995]

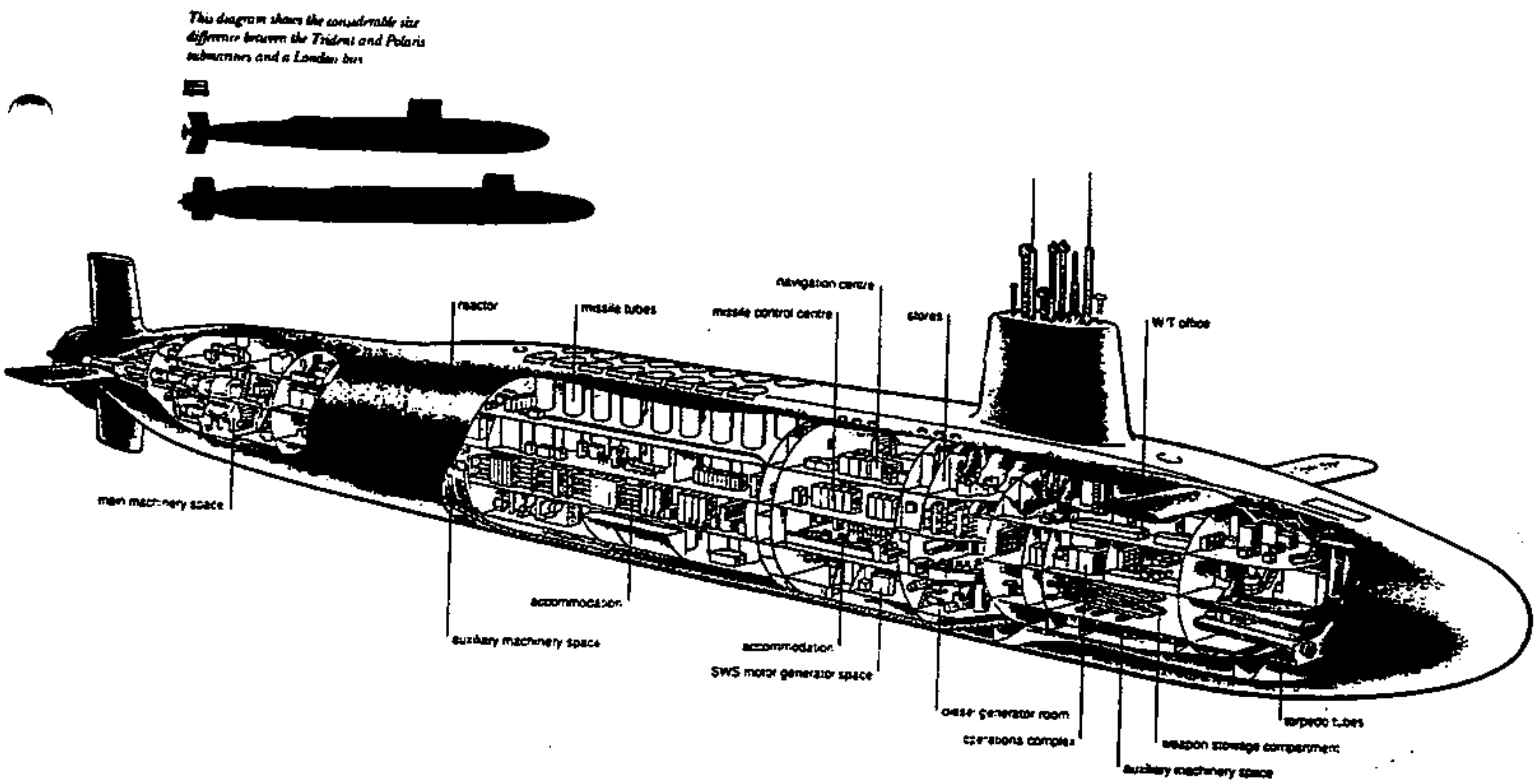

FIGURE 2.1-4
BRITISH TRIDENT SUBMARINE LAYOUT
Source: British Ministry of Defence

The third boat, *HMS Vigilant*, was rolled out of the shed at Barrow-in-Furness on 14 October 1995. CND expects it to arrive at Faslane in 1996, and to go on its first patrol in early 1998. The fourth submarine, *HMS Vengeance*, is still under construction at VSEL-Vickers in Barrow-in-Furness, and expected to go on its first patrol in 2000. Specifications for British Trident submarines are given in Figure 2.1-6.

* * * * *

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FIGURE 2.1-5
US TRIDENT SUBMARINES

SSBN	*USS*	COMMISSION DATE	HOME PORT	MISSILE
726	*Ohio*	Nov 11 81	Bangor	C-4
727	*Michigan*	Sep 11 82	Bangor	C-4
728	*Florida*	Jun 18 83	Bangor	C-4
729	*Georgia*	Feb 11 84	Bangor	C-4
730	*Henry M.Jackson*	Oct 6 84	Bangor	C-4
731	*Alabama*	May 25 85	Bangor	C-4
732	*Alaska*	Jan 25 86	Bangor	C-4
733	*Nevada*	Aug 16 86	Bangor	C-4
734	*Tennessee*	Dec 17 88	Kings Bay	D-5
735	*Pennsylvania*	Sep 9 89	Kings Bay	D-5
736	*West Virginia*	Oct 20 90	Kings Bay	D-5
737	*Kentucky*	Jul 13 91	Kings Bay	D-5
738	*Maryland*	Jun 13 92	Kings Bay	D-5
739	*Nebraska*	Jul 10 93	Kings Bay	D-5
740	*Rhode Island*	Jul 9 94	Kings Bay	D-5
741	*Maine*	Jul 29 95	Kings Bay	D-5
742	*Wyoming*		Kings Bay	D-5
743	*Louisiana*		Kings Bay	D-5

FIGURE 2.1-6
BRITISH TRIDENT SUBMARINES

SSBN	*HMS*	FIRST PATROL	HOME PORT	MISSILE
05	*Vanguard*	13 Dec 94	Faslane	D-5
06	*Victorious*	7 Jan 96	Faslane	D-5
07	*Vigilant*	Early 1998*	Faslane	D-5
08	*Vengeance*	2000*	Faslane	D-5

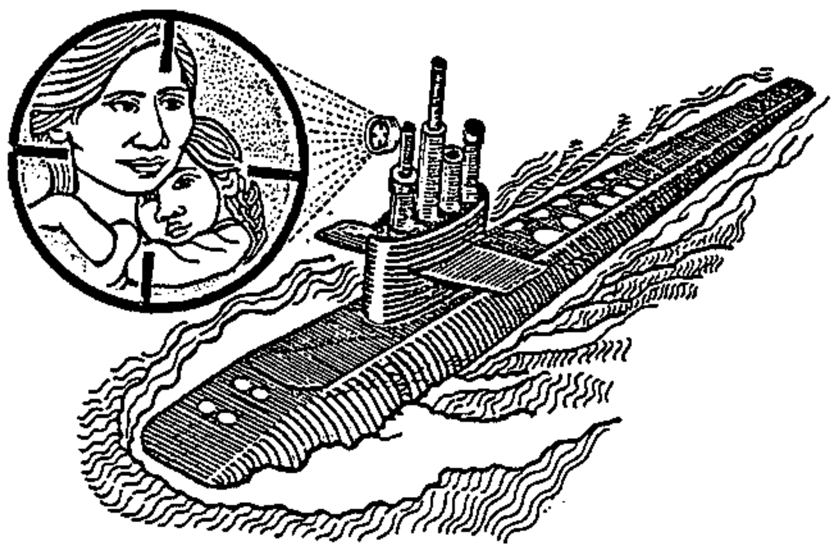
* Expected

FIGURE 2.1-7
US TRIDENT SUBMARINE SPECIFICATIONS

Length	560 feet (170.7 meters)
Hull Diameter	42 feet (12.8 meters)
Height	4 stories
Displacement	16,764 tons surfaced 18,750 tons submerged
Speed	20 plus knots (US Navy) 30 knots (non-governmental organizations.)
Power Plant	1 pressurized water nuclear reactor. 2 geared turbines, 1 shaft. 90,000 horsepower.
Navigation System	2 Mark-2, Mod-7 Ship Inertial Navigation System (SINS). Electrostatically Supported Gyro Navigator (ESGN). Satellite Receiver.
Crew	157 with Trident-1 missiles. (15 officers and 142 enlisted men.) 165 with Trident-2 missiles. (15 officers and 150 enlisted men.)
Armaments	4 torpedo tubes. 24 Trident SLBMs carrying up to 192 Mk-4/W-76 or Mk-5/W-88 MIRVs.

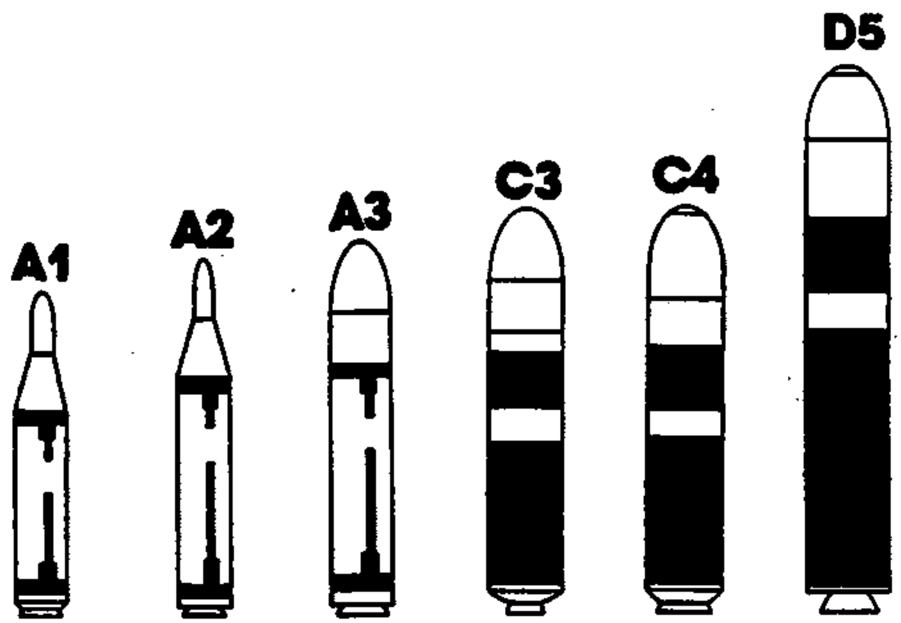
FIGURE 2.1-8
BRITISH TRIDENT SUBMARINE SPECIFICATIONS

Length	491 feet (149.6 meters)
Hull Diameter	43.3 feet (13.2 meters)
Height	4 stories
Displacement	16,000 tonnes submerged
Speed	25 knots submerged
Power Plant	1 pressurized water PWR-2 nuclear reactor. Geared steam turbines, 1 shaft
Navigation System	
Crew	132
Armaments	4 torpedo tubes for Spearfish torpedos. 16 Trident-2 SLBMs carrying up to 128 Mk-4/100-kt MIRVs



2.2 TRIDENT MISSILES: PRECISION DELIVERY VEHICLES

Submarine-launched Trident missiles have important advantages over ICBMs. They can reach their targets in 10-15 minutes as compared to 30 minutes for an ICBM. They can approach those targets from all directions from unknown launch points, as opposed to only over the north pole for ICBMs launched from fixed silos of targeted locations. Those advantages would confuse detection and greatly enhance the element of surprise which is needed for a first strike. On top of that, Trident missiles hold enough warheads to pro-



	Polaris (A1)	Polaris (A2)	Polaris (A3)	Poseidon (C3)	TRIDENT I (C4)	TRIDENT II (D5)
Length (ft.)	28.5	31.0	32.32	34.0	34.0	44.6
Diameter (in.)	54	54	54	74	74	83
Weight (lb.)	28,800	32,500	35,700	64,400+	73,000+	130,000+
No. of motors	2	2	2	2	3	3
Range (naut. mi)	1,200	1,500	2,500	2,500	4,000+	4,000+

FIGURE 2.2-1
SLBM COMPARISON CHART
Source: US Navy

vide a first-strike force all by themselves, against any adversary, while remaining invulnerable to a sneak attack. Trident missiles, supported by extreme low frequency (ELF) submarine communications and NAVSTAR, make ICBMs obsolete. (ELF and NAVSTAR will be discussed in Section 3.)

A. TRIDENT-1 (C-4)

Trident-1 missiles would be key players in a first-strike capability. They are now fully operational with some 192 missiles deployed in the Pacific in 8 Trident submarines. Fiscal year 1984 was the last year Trident-1 missiles were ordered, bringing the total number procured to 570. Fiscal year 1989 was the last year funds were requested for the Trident-1 program.

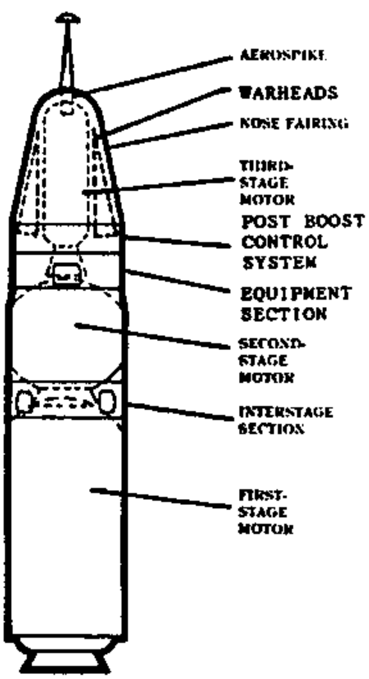


FIGURE 2.2-2
TRIDENT-1 (C-4) MISSILE
Source: US Navy

Each missile can carry eight 100-kiloton Mark-4/W-76 MIRVs. That adds up to 1,536 warheads poised to strike. Even missiles on submarines in port could reach their targets, but because of their longer flight time they would have to carry the second warhead assigned to each silo. Figure 2.2-5 provides the Trident-1 (C-4) missile specifications.

C-4 missiles are not precise enough, and the Mark-4/W-76 warheads not powerful enough, to destroy sufficient silos for a first strike without outside navigation aid. With its one-dimensional stellar inertial guidance (SIG) system the missile follows a single star as a guide toward its target. This system of updating the inertial navigation package provides an accuracy of about 750 feet. But if the missiles, themselves, received in-flight course corrections from NAVSTAR satellites they could deliver the bombs within 300 feet of their targets. By sending two warheads from different missiles to the same target, known as 2-on-1 cross targeting, the probability of destroying a hardened missile silo would be 93 percent. Such a hard-target capability would establish the Trident-1 as a true first-strike weapon, but that is not the end of US overkill in the post-cold-war era.

B. TRIDENT-2 (D-5)

Eight Trident submarines currently operate out of Sub-Base Kings Bay in Georgia, loaded with the new Trident-2 missiles. Two more subs will be delivered by 1997. That will complete the production of 18 subs total. (Later, four of the older subs will be retired bringing the final inventory to 14 subs.) When 21 subs were planned, the Navy wanted 28 development and 871 procurement missiles. For the 14-submarine program the required number of procurement missiles is much lower. If none of the west-coast Trident subs are retrofitted to carry Trident-2 missiles, the 337 missiles delivered by the end of fiscal year 1995 would be sufficient.

Trident-2s have the accuracy and quick delivery time necessary to decapitate command posts, as well as demolishing silos. The 24 missiles on each submarine can deliver 192 Mark-5/W-88, 475-kiloton warheads. Using the 2-on-1 cross-targeting pattern, 95 percent of hardened command posts or missile silos would be destroyed. However, because of safety and manufacturing problems only about 400 W-88 warheads were produced. Consequently, the Mark-4/W-76 warhead was introduced on Trident-2. Specifications of the Trident-2 (D-5) missile are given in Figure 2.2-6.

Because of the 400-500 foot accuracy possible with the two-dimensional SIG system, which triangulates on two stars to update the inertial guidance package, NAVSTAR in-flight fixes are not necessary for the Trident-2/Mark-5 combination. The increase in silo-kill efficiency for two-on-one cross targeting would be less than one percent. NAVSTAR is still needed, however, to accurately position the submarine while launching missiles.

The Trident-2/Mark-4 combination is not as deadly. Trident-2 missiles could carry 12-14 Mark-4/W-76 warheads but they are limited to eight by the START-1 Treaty. Since this warhead has 100 kilotons yield, rather than 475, the 2-on-1 cross-targeting probability of destroying a hard target would be reduced to 84 percent. For that reason, if the missile carries Mark-4 reentry vehicles it would require in-flight navigation fixes from NAVSTAR to give it a first-strike silo-kill probability of 93 percent. However, for many targets in the post-cold-war era, which are softer, the probability of kill would be more than adequate.

Funded in the Research, Development, Testing and Evaluation (RDT&E) area is the SLBM Effectiveness Enhancement program for Trident missiles. Among other things it addresses the ability to retarget Trident-2 SLBMs in the submarine.

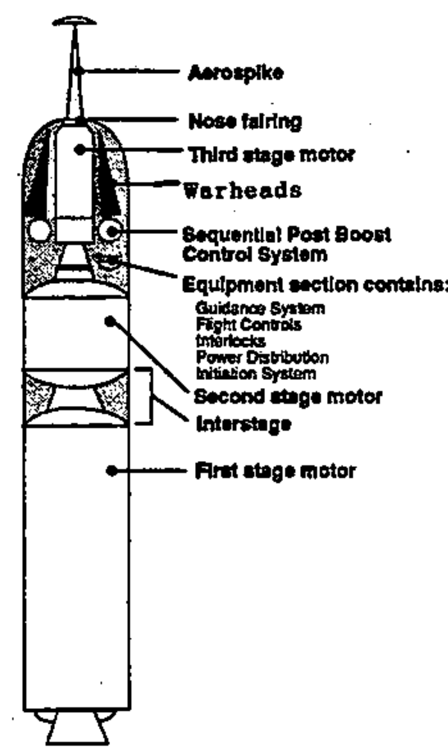


FIGURE 2.2-3
TRIDENT-2 (D-5) MISSILE
Source: US Navy

C. BRITISH MISSILES

The Polaris A-3 is still operational on British missile-launching submarines. It was the first missile with multiple reentry vehicles (MRVs), all of which went to the same target but hit in a triangular pattern to distribute the damage more "effectively." (Not to be confused with MIRVs which can be sent to different targets.) The A-3 is 32.32 feet long, 54 inches diameter, and weighs 35,700 pounds. Its two-stage rocket motors boost the missile to a range of 2,500 nautical miles. The 1962 Nassau Agreement between Prime Minister Harold Macmillan and President John Kennedy provided for purchase of those missiles. It is believed that Britain's share of development costs was written off in exchange for a lease on the island of Diego Garcia, which has become the key US base in the Indian Ocean.

On 15 July 1980 British Prime Minister Margaret Thatcher announced that she had arranged with US President Jimmy Carter to purchase Trident-1 (C-4) missiles, along with necessary support equipment, for the new British submarines. Almost two years later, on 11 March 1982, the Reagan administration agreed to furnish the more modern Trident-2 (D-5) missiles. This decision neglected a poll where 63 percent of some 1,040 Britons surveyed were in favor of dismantling their nuclear force. [*New York Times*, 28 February 1982, p. 3] It became public in September of that same year that the missiles would be serviced at US Sub-Base Kings Bay in Georgia, rather than at RNAD Coulport in Scotland. British missiles are ordered and stored with US missiles. They are not assign- ed to Britain until they are drawn out of inventory to in- stall in a submarine. When the British submarine goes into its seven-year, long-term overhaul, the missiles (less their warheads) will be unloaded at Sub-Base Kings Bay in the US. The missiles will normally stay in the submarine for the duration of its seven-year commission, but capabilities will be available if in an emergency the missiles must be removed at RNAD Coulport.

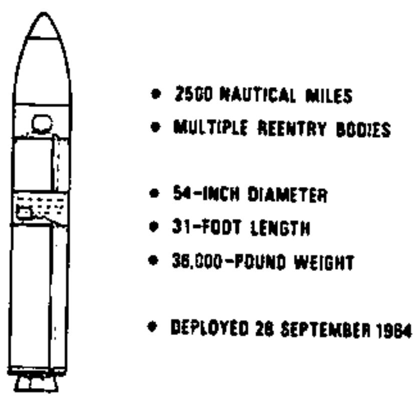


FIGURE 2.2-4
POLARIS (A-3) MISSILE
Source: Lockheed

So far, 44 Trident-2 missiles have been purchased by Britain -- 3 in fiscal year (FY) 1990, 23 in FY 1992, and 18 in FY 1993. (US FYs run from 1 October through 30 September). None were purchased in FYs 1994 through 1996. The total number remaining to be bought is classified in Britain but US sources indicate 21 -- 7 each in FYs 1997, 1998, and 1999. So far, four British missiles have been fired in DASO tests. Others have been drawn out of inventory to equip the first two British submarines. According to Scottish CND the second submarine, *HMS Victorious*, was only outfitted with 12 missiles. The reason for this reduced load is not known.

Figure 2.2-6 can be used as a description of the British Trident-2 missile. The MIRV warhead will have the Mark-4 reentry vehicle shell but the bomb is ostensibly of British manufacture. By a political decision, and not because of capability constraints, the missiles will carry an average of only eight MIRVs each -- no more than 128 warheads on each submarine. In fact, the Ministry of Defence now states that each submarine will carry no more than 96 warheads, and possibly significantly fewer. [Nuclear Weapons section of 1994 Defence White Paper, p. 19]

D. THE TACTICAL TRIDENT

The use of Trident missiles in a regional war as a tactical nuclear weapon has been discussed and speculated on since at least the end of the cold war. And there is good cause for such discussion and speculation. We still have the same military leaders who planned total thermonuclear war that would incinerate and irradiate the globe. Why wouldn't they now fashion a strategy to nuke a few upstart dictators if it served their national interests -- especially if that strategy justified their favorite weapon, Trident? Let us look a the evidence.

1. American Strategy.

When in late 1991 Air Force General Lee Butler, then director of US nuclear targeting, convened the Joint Strategic Target Planning Advisory Group, he set in motion the crafting of post-cold war nuclear doctrine. Under the chairmanship of former Air Force Secretary Thomas Reed, this so-called Reed Panel made four far-reaching recommendations which point a significant finger toward the tactical use of Trident missiles. These were explained in Chapter 1.1 but will be reviewed here in context.

The first of these was to retain a significant number of strategic nuclear weapons to preserve America's prestige and dissuade nuclear proliferation by countries such as Germany and Japan. This did not relate too much to tactical situations but let us go on.

The second recommendation was that America should rethink its 1979 pledge not to use nuclear weapons against a non-nuclear country. Since chemical and biological armaments are classed as weapons of mass destruction, the Reed Panel's rationale was that nuclear weapons should be used to deter their use, also.

Thirdly, the Reed Panel suggested that nuclear arms be used to protect America's interests through preventing hostilities in the Third World by targeting countries that have never been targeted before. The purpose of this would be to prevent annihilation of states such as Israel and Taiwan, or the seizure of critical raw materials such as oil, or foreign dominance of a sector of space.

The fourth recommendation tied all this revised nuclear doctrine together and pointed to Trident as the centerpiece. The Reed Panel outlined a "Nuclear Expeditionary Force" armed with a few air-launched and submarine-launched strategic weapons. We have heard about a few conventionally-armed air-launched cruise missile being used in the Persian Gulf war. This was certainly a practice exercise for the strategic nuclear version. But the only submarine launched strategic weapon is Trident. What the Reed Panel was refering to was a tactical Trident.

Since the retirement of land-based and sea-based tactical nuclear weapons the US Air Force has held a monopoly in that area. Some 800 tactical B-61bombs make up the entire US inventory of tactical nukes. Nevertheless, it has been difficult for the Navy to regain a footing in that area. But the admirals are trying. And their statements to that effect seem purposely aimed at confusing the public. For instance, in September 1994 during public discussion on how to counter the chemicnd biological threat, Assistant Defense Secretary Ted Warner said that the development of conventional versions of Trident missiles is not at the forefront of Pentagon thinking regarding ways to use strategic assets in a conventional role. [*Defense News*, 19 September 1994, p. 12] Of course itsn't. The Reed Panel wasn't talking about putting conventional bombs on Trident. It was talking about using Trident-delivered nuclear bombs against regional targets. But introducing conventional weapons into the discussion steered the thinking safely away from the real plans. (It should be noted, however, that the 11th DASO test on

18 November 1993 used conventional warheads.)

Threats of atomic, biological and chemical wafare again surfaced in the media during June 1995. This was in the context of fighting a war 20 years from now. Andrew Krepinevich, director of the Defense Budget Project, emphasized the need for long-range precision strikes against missile emplacements and other facilities far behind enemy lines. [*Defense News*, 5 June 1995, p. 1] The capability to do this exceeds the performance record of even the smartest conventional bomb. Effectively destroying those hard-to-reach and hard-to-kill targets requires the destructiveness of nuclear energy.

The debate on how nuclear policy should interact with the threat of chemical and biological weapons really heated up in August 1995 when Tariq Aziz, Iraq's deputy foreign minister, announced that only the threat of nuclear retaliation prevented Sadam Hussein from using chemical weapons during the Persian Gulf war. By September 1995 the Pentagon was under pressure to clarify its nuclear doctrine in this regard, at least publicly -- it has already been spelled it out internally: "The normal peacetime role of the ballistic missile submarine will continue to be nuclear deterrence.... Endurance and responsiveness, coupled with the submarine's survivability, will provide a prevasive threat to *any nation* considering the employment of nuclear, *chemical*, or *biological* weapons against the United States or its allies." [*Submarine Roles in the 1990s and Beyond*, p. 11; emphasis added] Whatever, the pressure is on, and the public will be hearing more about how the US plans to respond to the chemical/biological threat. Don't be surprised when you learn that Trident is the centerpiece of those plans.

2. British Strategy.

Britain has been a little more blatant in acknowledging its intention to use Trident in a tactical role -- which it refers to as sub-strategic. In October 1993 Britain's then Secretary of State for Defence, Malcolm Rifkind, told the House of Commons that the Royal Navy would assume the sub-strategic nuclear role which had previously been Air Force turf. He set the date as 2004 when the Royal Navy will take over this responsibility, and named the Vanguard-class Trident submarines as the dispenser of sub-strategic weapons. [*Defense News*, 19 September 1994, p. 12]

In the Nuclear Weapons Section of its 1994 Defence White Paper, the Ministry of Defence says that a massive nuclear strike is not enough to insure deterrence. It says: "We also need the capability to undertake nuclear action on a more limited scale in order to demonstrate our willingness to defend our vital interests to the utmost, and so induce a political decision to halt aggression without inevitably triggering strategic nuclear exchanges." The MoD further stated: "We also intend to exploit the flexibility of Trident to provide the vehicle for both the sub-strategic and strategic elements of our deterrent." [Nuclear Weapons Section of 1994 Defence White Paper, p. 19] Milan Rai has done an excellent job of documenting British ambitions for a tactical Trident. [See References below]

* * * * *

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FIGURE 2.2-5

TRIDENT-1 MISSILE SPECIFICATIONS

Length	34.0 feet (10.36 meters)
Diameter	74 inches (1.88 meters)
Launch weight	71,000+ pounds (32,000+ kilograms)
No. of motors (stages)	3 plus post-boost control system.
Motor Case Materials	Kevlar/Epoxy.
Propellant	Solid -- Cross-linked double base. Ammonium perchlorate, aluminum, nitrous cellulose-nitroglycerin, and HMX.
Range	4,000+ nautical miles (7,400+ kilometers) with a full load of warheads.
	Up to 6,000+ nautical miles (11,000+ kilometers) with a reduced load of W/Hs.
	An aerospike which telescopes out the tip of the nose fairing after the missile is launched, forms a streamlined air flow to increase range.
Navigation system	One-dimensional stellar inertial guidance (SIG).
	NAVSTAR GPS update to position submarine before launch.
	Possibly NAVSTAR receivers in the missile.
Accuracy	300-400 feet CEP with NAVSTAR receivers in missile.
Max. warhead loading	8 Mark-4/W-76, 100 kt MIRVs.

FIGURE 2.2-6
TRIDENT-2 MISSILE SPECIFICATIONS

Length	44.6 feet (13.75 meters)
Diameter	83 inches (2.13 meters)
Launch weight	130,000 pounds (58,968 kilograms)
No. of motors (stages)	3 plus post-boost control system.
Motor Case Materials	1st Stage -- Graphite/Epoxy 2nd Stage -- Graphite/Epoxy 3rd Stage -- Kevlar/Epoxy
Propellant	Solid -- Nitrate ester plasticized polyethylene glycol.
Range	4,230 nautical miles (7,838 kilometers) with a full load of warheads. Up to 6,000+ nautical miles (11,000+ kilometers) with a reduced load of W/Hs. An aerospike which telescopes out the tip of the nose fairing after the missile is launched forms a stream-lined air flow to increase range.
Navigation system	Two-dimensional stellar inertial guidance (SIG). NAVSTAR GPS update to position the submarine before launch.
Accuracy	400-500 feet CEP.
Max. warhead loading	8 Mark-5/W-88, 475 kt. MIRVs, or 12 Mark-4/W-76, 100 kt MIRVs.

FIGURE 2.2-7
TRIDENT-2 MISSILE FLIGHTS
(British flights not included)

FLIGHT	DATE	RESULTS	REMARKS
Dev. #1	Jan 15 1987	Success reported	Launch delayed 2.5 hours due to antenna and computer problems.
Dev. #2	Mar 17 1987	Success reported	
Dev. #3	Apr 30 1987	Success reported	
Dev. #4	Jun 12 1987	Success reported	
Dev. #5	Jul 20 1987	Success reported	
Dev. #6	Sep 8 1987	Success reported	9 Mark-4 RVs plus instrumentation package.
Dev. #7	Oct 6 1987	Failure	Malfunction in PBCS and Electronics Package. Navy claims Success.
Dev. #8	Dec 10 1987	Success reported	
Dev. #9	Jan 21 1988	Failure	Flight Control failure during 3rd stage burn. Navy claims Partial Success.
Dev. #10	Apr 7 1988	Success reported	
Dev. #11	Apr 28 1988	Success reported	
Dev. #12	May 25 1988	Success reported	Mark-4 RVs.
Dev. #13	Jul 7 1988	Failure	Thrust Vector Control System malfunctioned during 1st stage burn.
Dev. #14	Aug 27 1988	Success reported	
Dev. #15	Sep 19 1988	Failure	Missile went off course during 2nd stage burn. Navy claims a No Test.
Dev. #16	Nov 7 1988	Success reported	First stage performance questionable.
Dev. #17	Dec 19 1988	Success reported	
Dev. #18	Jan 9 1989	Unknown	
Dev. #19	Jan 26 1989	Success reported	Possible malfunction of submarine's deployment gas generator.
PEM-1	Mar 21 1989	Failure	Missile cartwheeled immediately after 1st stage ignition.
PEM-2	Aug 2 1989	Success reported	
PEM-3	Aug 15 1989	Failure	Missile exploded 4 seconds after launch.
PEM-4	Dec 4 1989	Success reported	
PEM-5	Dec 13 1989	Success reported	
PEM-6	Dec 15 1989	Success reported	

[MORE]

TRIDENT MISSILES

FLIGHT	DATE	RESULTS	REMARKS
PEM-7	Jan 151990	Success reported	
PEM-8	Jan 16 1990	Success reported	
PEM-9	Feb 12 1990	Success reported	1st of two launches 20 seconds apart. Navy calls this a DASO launch.
DASO #1	Feb 12 1990	Success reported	2nd of two launches 20 seconds apart.
DASO #2	Mar 11 1990	Unknown	
DASO #3	Sep 26 1990	Unknown	
DASO #4	Nov 29 1990	Unknown	
DASO #5	Apr 15 1991	Unknown	
DASO #6	Aug 30 1991	Unknown	
DASO #7	Nov 11 1991	Unknown	
DASO #8	Jul 29 1992	Unknown	
DASO #9	Nov 19 1992	Unknown	
DASO #10	Aug 20 1993	Unknown	
DASO #11	Nov 18 1993	Unknown	Tested with conventional warheads.
DASO #12	Dec 1 1994	Unknown	
DASO #13	Dec 7 1995	Unknown	
CET #1-4	Nov 3 1990	Unknown	4 missiles launched
CET #5-8	Jul 29 1991	Unknown	4 missiles launched
CET #9-12	Nov 11 1991	Unknown	4 missiles launched
CET #13-16	Feb 22 1992	Unknown	4 missiles launched
CET #17-20	Jun 18 1992	Unknown	4 missiles launched
CET #21-24	Aug 4 1992	Unknown	4 missiles launched
CET #25-28	Sep 3 1992	Unknown	4 missiles launched
CET #29-32	Nov 10 1992	Unknown	4 missiles launched
FCET #1-2	Jul 7 1993	Unknown	2 missiles launched
FCET #3-6	Jan 20 1994	Unknown	4 missiles launched
FCET #7-8	Jan 19 1995	Unknown	2 missiles launched
FCET #9-10	Apr 19 1995	Unknown	2 missiles launched

Development tests are pad launch. All others are from a submarine.
The Strategic Submarine Branch of the US Navy states that flight test results from PEM, DASO, CET and FCET are classified and not reportable.

Dev. = Development missile.
PEM = Production Evaluation Missile.
DASO = Demonstration And Shakedown Operations (for new submarines).
CET = Commander-in-chief Evaluation Test (from operational subs).
FCET = Follow-on CET.

FIGURE 2.2-8

BRITISH TRIDENT-2 MISSILE FLIGHTS

FLIGHT	DATE	RESULTS	REMARKS
DASO	May 94	Not Avail.	From *HMS Vanguard*
DASO	June 94	Not Avail.	From *HMS Vanguard*
DASO	25 Jul 95	Not Avail.	From *HMS Victorious*
DASO	Not Avail.	Not Avail.	From *HMS Victorious*

FIGURE 2.2-9
TRIDENT-2 MISSILE PROCUREMENT
ACTUAL AND PLANNED

FISCAL YEAR	US MISSILES ORDERED	BRITISH MISSILES ORDERED	US UNIT PRICE *	BRITISH UNIT PRICE
1987	21		62.6/82.2	
1988	66		30.3/38.3	
1989	66		28.0/34.1	
1990	41	3	32.6/38.3	
1991	52		28.2/32.2	
1992	28	23	35.8/40.0	
1993	21	18	41.5/45.3	
1994	24		46.9/49.7	
1995	18		38.4/39.6 est.	
1996	6		55.3/55.3 est.	
1997	7 planned	7 planned	---/51.3 est.	
1998	7 planned	7 planned	---/51.7 est.	
1999	7 planned	7 planned	---/58.1 est.	
2000	12 planned		---/52.3 est.	
2001	12 planned			
2002	12 planned			
2003	12 planned			
2004	12 planned			
2005	10 planned			

* "Then year" dollars/1986 dollars (both in millions)

Missiles are usually delivered two years after ordering.

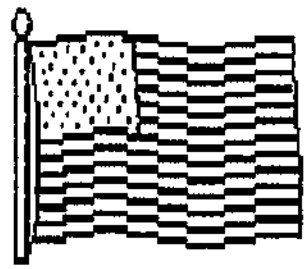
Trident-2 missile production will stop at end of fiscal year 2005 unless service life of Trident submarines is increased to 40 years.

2.3 TRIDENT WARHEADS: FAST, TRICKY, AND BURROWING

Early in the nuclear age, in an effort to insure civilian control over the military, the Atomic Energy Commission was established to take charge of all things nuclear. That commission has now evolved into the Department of Energy (DOE) which has the last say regarding nuclear bombs. But in a bureaucratic struggle the Department of Defense (DOD) became designer and fabricator of the reentry vehicle shells which encase the bombs and protect them from the tremendous heat encountered while reentering the earth's atmosphere. That is why warheads have "Mark" and "W" designations. The "Mark" number is DOD's identification of a specific reentry vehicle shell. The "W" number is DOE's bomb model.

After a DOD contractor fabricates the reentry vehicle shell, it is sent to Pantex, Texas where the DOE agent installs the bomb. The assembled reentry vehicle, with bomb inside, is then sealed and turned over to DOD for deployment. If for any reason the reentry vehicle must be disassembled, it is returned to Pantex.

In this handbook I shall use, for instance, Mark-4 or Mark-5 when referring to reentry vehicle shells. W-76, W-88, and the like will designate bombs. And the Mark-4/W-76 or Mark-5/W-88 assemblies will be called warheads. I may refer to either a reentry body or the total warhead as a MIRV. This terminology is not entirely consistent but it should simplify the language somewhat.



A. AMERICAN WARHEADS

There are currently two warhead sizes for US Trident missiles. The Mark-4/W-76 has 100 kilotons yield and can be carried eight maximum on Trident-1 and 12-14 on Trident-2, but the US is restricted to 8 by START-1. The Mark-5/W-88 warhead has 475 kilotons yield and can be carried eight maximum on Trident-2 only. It is too big to fit on Trident-1.

1. Mark-4 and Mark-5.

Problems at the Rocky Flats plant in Colorado, combined with lack of safety features in the bomb itself, have halted the production line for W-88 bombs. An official production halt was announced by President Bush during his January 1992 State-of-the-Union address. According to Rear Admiral Raymond G.Jones Jr., there are enough Mark-5/W-88 warheads to equip the first four east-coast Trident submarines. From then on Trident-2 missiles will be loaded with the 100-kiloton Mark-4/W-76 warheads which became available as refitted Poseidon submarines were deactivated. [SASC-92, Part 2, p. 111.]

Other sources say that only about 400 of the Mark-5/W-88 warheads have been produced. That is enough for two submarines, not four as Admiral Jones indicated. [*The Sun*, 20 December 1991] If the 400 number is correct, then three possibilities could exist: (a) the first four east-coast submarines are not fully loaded with missiles, (b) their missiles do not carry a full load of warheads, or (c) some of the missiles on those submarines are loaded with the smaller Mark-4/W-76 warheads. But there may be another possibility in the offing.

2. *A Mark-5/W-89 Warhead?*

A likely candidate for Trident is a W-89 bomb in the Mark-5 reentry vehicle. Like the W-87, it has all the latest safety features. The W-89 is not in production or in the stockpile. It was originally slated for the Sea Lance anti-submarine missile and the SRAM-2, both of which have been cancelled. But the W-89 went ahead, anyway, as a technology demonstration program for recycling the "pits" (plutonium triggers) from retired nuclear weapons. This means the W-89 could go into production using the nuclear cores from old warheads, even though Rocky Flats remains closed. Dr. Ray Kidder says this could be accomplished in three years but would require three underground nuclear tests. [See Kidder, pp. 12-14]

Later there appeared in the DOE budget for Lawrence Livermore National Laboratory a line item called "Submarine Launched Ballistic Missile Replacement Warhead." Could this be a continuation of the W-89 pit recycling study? At any rate, the replacement warhead study was completed in fiscal year 1994. [See Beers.]

B. MARVING THE MIRVS

Perhaps another reason the large Trident warhead was cancelled is because new developments are coming to a head. Maneuvering reentry vehicles (MARVs) have been in development and testing for over two decades. A MARV was deployed on the now-deactivated Pershing-2 missiles. An earth-penetrating MARV was also designed for Pershing-2 but never deployed. MARV development dates back to the late 1960s.

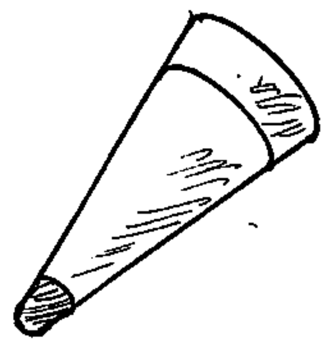
1. *Chevaline, SRB, and the Mark-500.*

Britain started the Chevaline warhead for its Polaris missiles in 1969. Chevaline is a rudimentary MARV. All ground- and flight-test work was done on the US Eastern Test Range and at Cape Canaveral, Florida. [*AW&ST*, 4 February 1980, p. 31; *AW&ST*, 16 Jun 80, p. 263.] The bomb was developed at the Nevada Test Site. It was the mid-1980s before Chevaline warheads were finally installed on all British Polaris missiles. With a price tag of 2-billion pounds, it turned out to be a very long and very expensive program.

The exact number of Chevaline warheads on each missile is not publicly announced. Some observers refer to three and others say two. I believe two is correct.

All Chevalines go to the same target, but they perform pre-programmed maneuvers to confuse interceptor missiles which might be guarding the target city. One might even act as a decoy while the second is aimed at the target.

I also believe Chevaline warheads are in the 75-100 kiloton range because the US Navy had a parallel effort during the late 1960s. It started off as an independent-development project at Lockheed (funds furnished by the DOD for Lockheed to use to enhance their know-how as a Pentagon contractor). This Special Reentry Body (SRB), as it was called, had an asymmetric exterior shape with a bent nose tip that caused the vehicle to ride nose high as it reentered the atmosphere -- what aerodynamicists would call a high angle of attack.



The SRB also had interior weights which could slide from side to side. When the weights shifted to the right, for example, the center of gravity would become misaligned from the center of pressure. Aerodynamic forces would then tend to re-align these centers along the flight path by rolling the SRB clockwise. But, being asymmetric, the SRB would then turn to the right. This can be crudely analogized to maneuvering a surf board by shifting body weight.

By carefully calculating the distance and timing of weight shifts, the SRB can be programmed to perform pre-planned maneuvers, ostensibly to evade interceptor missiles or to confuse the opponent regarding the missile's aim point. Inherently, this system is less accurate than a strictly ballistic reentry vehicle -- to improve accuracy it would require the target-sensing MARV being investigated by other companies. Nevertheless, flight tests of the SRB design would accumulate much data that is directly transferable to a precision MARV.

The SRB evolved into the US Navy's Mark-500 MARV for the Trident-1 missile. It was never deployed but it was flight tested on modified Atlas missiles launched from Vandenberg Air Force Base as well as on some Trident-1 development flight tests from Cape Canaveral. For a while I had design responsibility for both the SRB and the Mark-500. One ground rule was that the Mark-500 use the same warhead as the Mark-400 (now the Mark-4) ballistic MIRV. At the time I left Lockheed that warhead was 75 kilotons. It has since been increased to 100 kilotons.

Since the Chevaline program was also proceeding during the 1970s, I believe it benefitted from the flight tests of the Mark-500 MARV. The last funding for the Mark-500 was in FY 1983, after Chevaline deployment had started. It seems likely that Britain also designed its Chevaline for 75-100 kiloton bombs. If that is true, Chevaline warheads should fit into the Mark-4 reentry vehicle shells being purchased from the US.

2. *Mark-6 And Earth Penetrators.*

Although development of MARVs began in the 1960s, there has been scant information in the public domain about them since the early 1980s. Evidence does exist, however, that a target-homing MARV is being developed for Trident-2.

The last big flurry on information about MARVs came in 1984. Boeing, Convair Division of General Dynamics, Martin Marietta (now merged with Lockheed), and Bell Aerospace Texron were awarded $5-million each to define a concept for a MARV to be used on the Midgetman small ICBM. Technology was to be drawn from all existing strategic and tactical programs, including cruise missile guidance, to define a target-homing sensor. DOD plans then were to spend $1 billion through FY 1989 to develop a precision MARV with zero-miss capability that could also be used on Trident-2 missiles. [*AW&ST*, 5 March 1984, pp. 14-15]

In 1984 I was supplied with internal budget documents from General Electric's Reentry Systems Operations office in Philadelphia (since assumed by Martin Marietta which in turn has merged with Lockheed). In addition to other reentry vehicle work, that office was also working on a MARV for Trident-2 designated Mark 6. As far as I can translate the acronyms and abbreviations used, the sales projection for Mark-6 MARVs increased from something like $2.5 million in 1984 to at least $78 million in 1989. The scheduled operational date was 1988.

Supplementing the GE papers are the "Approved Parts Vendor List -- Procurement Data" (10 Aug 84) for the Trident-2 Mark-6 MARV. This list was obtained through a Freedom of Information Act request from the technical director of the US Navy's Strategic Systems (Trident) Program Office. The page I received listed 28 reentry vehicle parts, most of which did not have common usage with the Mark-5 MIRV.

Still other documents evincing a Trident-2 MARV came from OECO Corporation in Portland, Oregon (obtained from a public source -- the dumpster outside the plant). One is a handwritten interoffice memo, dated 12 Jun 85, listing schedules for Trident-2 Mark-6 parts. The other, with the same date, is page one of a master schedule for Trident-2 Mark-6 operations.

1987 brought a spattering of information about maneuvering warheads, this time in connection with an earth-penetrating capability. Earth-penetrators have a heavy outer case of specific shape so the bomb will burrow deep in the earth or frozen tundra before exploding. This converts more of the blast into ground shock which is 20-50 times more deadly to underground emplacements than a surface burst. Underground blasts also minimize the fratricide phenomenon whereby early nuclear explosions destroy warheads arriving later. This type of warhead would be especially effective for a tactical Trident.

In February 1987 the Air Force announced a nine-month study to develop a prototype for an earth-penetrating MARV to be used on ICBMs. [*AW&ST*, 16 February 1987, p. 11] By mid-year the Defense Department was embarking on a year-long, highly-classified study to develop earth penetrators. Then Strategic Air Commander, General John T. Chain Jr., maintained that an accurate earth penetrator was a high priority. But to deliver one with a ballistic missile would require a MARV which could be slowed down and glide to its target. [*AW&ST*, 8 June 1987, p. 28]

Also in 1987, the Air Force revealed interest in a hypersonic glide vehicle which would be highly maneuverable and extremely precise to attack high-value targets with non-nuclear warheads. But the top speed of this vehicle was to be Mach 20 and higher -- a speed typical of long-range ballistic missiles. In fact, the missile picked to test this

MARV was a Minuteman-1 ICBM booster. [*Air Force Magazine*, May 1987, pp. 24 & 26]

Later in 1987, Lockheed and General Electric were awarded Air Force contracts to develop prototype designs for an earth-penetrating MARV for use on ICBMs. [*AW&ST*, 10 August 1987, p. 32] Then Department of Energy Assistant Secretary for Defense Programs, retired Admiral Sylvester R. Foley, confirmed that the DOE was looking into the feasibility of a penetrating MARV warhead, to be used with ICBMs and SLBMs as prime candidates. [*Air Force Magazine*, August 87, p. 22] That DOE study, to be completed in early 1989, was looking at two areas: short-term modifications to existing bombs for the early 1990s, and a more intense study of what can be done for the mid to late 1990s. [HAC-89, pp. 779, 830-832, 908-910]

On 28 September 1988, a Genie rocket tested a penetrating warhead which was four feet long and contained a full-scale bomb with mock fissionable material. The first stage carried it up four miles and the second stage drove it back down into volcanic rock at 1,400 miles per hour. The warhead burrowed 22 feet deep and was recovered with the bomb in good condition. [*SJMN*, 20 October 1988, p. 38]

Probably not the configuration of a Trident-2 MARV, but certainly a prototype to test the concept, is Sandia National Laboratories' SWERVE (Sandia Winged Energetic Reentry Vehicle Experiment). Work on it began in the mid 1970s but I saw studies of this concept back in the late 1960s. This eight-foot-long, two-foot-diameter, cone-shaped vehicle is capable of extensive maneuvering at speeds of Mach 2 to Mach 14. Three tests took place in the mid 1980s but were not announced publicly until 1990. The last was in 1985. Rockets launched from Kauai, Hawaii boosted the SWERVEs to an altitude between 400,000 and 600,000 feet. The impact point was near Johnston Island in mid Pacific. Once the SWERVE reenters the atmosphere it can level off and glide for great distances to sense its target as it slows down, similar to the way a cruise missile operates. This is the desired final flight profile for an earth penetrator. [*AW&ST*, 6 August 1990, pp. 25 & 28]

At the end of 1991, the DOE's W-61 warhead was in development as an earth penetrator.

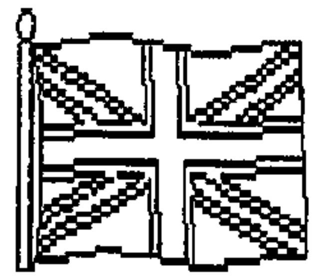
3. Micronuke, Mininuke, and Tinynuke.

The maneuvering aspect and target sensing of an earth-penetrating MARV will provide an accuracy of something like 40 feet. That means smaller bombs could be used to offset the added weight of the penetration shell. Such accuracy also means we can forget about complicated probability-of-kill equations -- if the weapon works, the target will be destroyed. Even a sub-kiloton warhead would have the capability to destroy the hardest targets.

According to William Arkin, Los Alamos National Laboratory (LANL) is designing sub-kiloton weapons for wars in the Third World, which might be the real reason the US has so strenuously resisted a nuclear test moratorium. [See Arkin, "Little Nuclear Secrets"] Micronuke is a 10-ton (.01 kiloton) nuclear bomb ten times more powerful than the largest conventional bombs used against Iraq. Its alleged use would be against underground command bunkers. Mininuke has 100 tons (.1 kiloton) yield. And tinynuke is a 1-kiloton warhead to counter attacking ground troops. According to "Inside The Air Force," a private newsletter, the Air Force is quietly researching these weapons under the Precision Low-Yield Weapons Design project (PLYWD -- pronounced plywood). [Arkin, "Little Nuclear Secrets"] Sub-kiloton bombs would be ideal low-weight payloads for an earth penetrating warhead. These warheads on Trident would fit the part of a nuclear expeditionary force employing a tactical Trident.

Development of mini-nukes, earth penetrators, and other exotic things were items in the 1993 DOE budget for the weapons labs. However, it is certain that only paper studies are allowed, not hardware development. A feeling at the national laboratories is that the nuclear weapons business is fading fast and the labs face a very uncertain future.

C. BRITISH WARHEADS



Britain is supposedly developing its own nuclear bomb but it could well be a carbon copy of the US W-76 warhead. British and US scientists work closely together at the Nevada Test Site and it is highly unlikely that the US W-76 bomb features were not duplicated.

Neither does the British government categorically deny that its bomb is a copy of the W-76. They waffle on the subject with such phrases as "not necessarily" or "I don't think you can." On 5 March 1992 Mr. Geoffrey Beaver, Deputy Controller for Nuclear Systems, told the House of Commons that the British warhead "is not necessarily a direct copy or based solely on W-76. Therefore, I do not think you can, even knowing the features of W-76, necessarily read across that those apply directly to the UK weapon..." [HC-337, p. 13] My impression from that statement is that, although not a **direct** copy, the British warhead is pretty much the W-76 design.

Let us review some history. As part of the original agreement to buy Trident-1 missiles, Britain also agreed to buy the reentry vehicles from the US. [*AW&ST*, 21 July 1980, p. 23.] The reentry vehicles Britain agreed to purchase with Trident-1 missiles were the Mark-4.

When the purchase agreement was changed from Trident-1 to Trident-2, Britain was stuck with a 100-kiloton-range bomb it had been working on. Therefore, Britain stayed with the Mark-4 reentry vehicle shell. The British House of Commons Defence

Committee confirmed this: "The reentry bodies we are purchasing from the United States are the Mark-4s, into which British-designed warheads will be incorporated." [HC-286, p. 7; Cited in McHugh, p. 2]

The actual number of warheads on each missile is secret, but official statements indicate a total. The British Secretary of State for Defence, while pointing out that the maximum warhead capacity of each submarine will not be used, restates the government position that each Trident submarine will initially carry no more than 128 warheads. But he modifies that statement: "The exact number deployed will reflect our judgment of the minimum required to constitute a credible and effective deterrent. Over time, we may have reason to revise this assessment: for example, if there are significant developments in anti-ballistic missile systems." [*Statement on the Defence Estimates 1992*, pp. 28 et. seq.] The door is open for change. However, the post-boost control system (PBCS, or "bus") design likely limits the number to eight.

More recently, the Nuclear Weapons Section of the MOD's 1994 Defence White Paper states: "We have long made clear that ... each submarine will carry no more than 128 warheads [an average of eight per missile]. In fact, on the basis of our current assessment of our minimum deterrent needs, each submarine will deploy with no more than 96 warheads [an average of six per missile] and may carry significantly fewer. [p. 19]

Warhead deliveries from AWE Burghfield to RNAD Coulport were to begin toward the end of 1992. And they apparently did as four warhead carriers arrived in the evening of 5 August 1992. [*Campaign*, September 1992, p. 3] Actually, a convoy including four warhead carriers was seen entering the Trident bunkers at RNAD Coulport as early as 10 January 1992. [Nukewatch UK August 1992 Newsletter]

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SECTION 3
SUPPORTING SYSTEMS

3.1 COMMUNICATION: NO GAPS ALLOWED

Communications is perhaps one of the most critical aspect of military activities. Submarines provide unique communications challenges. They are usually so far beneath the ocean's surface that ordinary radios cannot reach them. Messages sent in the low frequency (LF) band only penetrate the ocean to a depth of 9-12 feet. Very low frequency (VLF) transmissions can go about 30-40 feet deep. A submarine patrols much deeper than that. True, submarines can send antenna buoys close to the ocean's surface, or even on the surface, but that introduces the risk of being detected. To provide continuous, one-way communication with all the nation's submarines, and those belonging to Britain, the Pentagon has developed an extreme low frequency (ELF) capability.

A. ELF

Since ELF sends very slow signals in only one direction, it could more properly be called a "bell ringer" to call the submarine to attention. As John LaForge of the Lakes and Prairies Life community states it, ELF "can only shout, never listen." So we might keep that in mind when referring to ELF as a communications system.

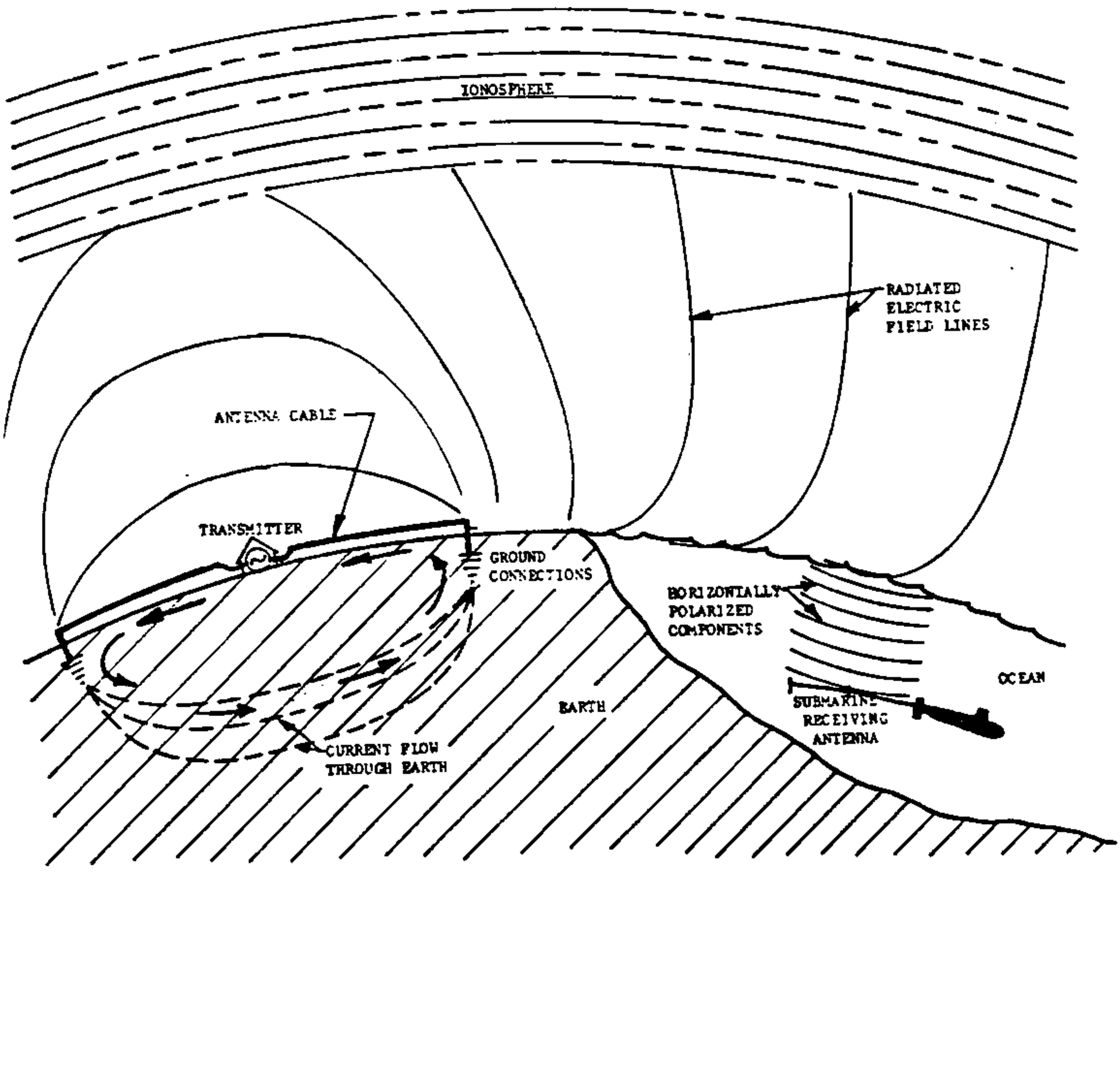
Nevertheless, ELF radio signals do provide continuous one-way contact with submarines because they penetrate seawater to depths of several hundred feet. It is reported that submarines as deep as 400 feet have been contacted in the Mediterranean. [Lucas, p. 52] Navy officials claim ELF is the only available means of continuous contact with submarines at patrol depth and cruising speed.

In 1969 the Navy constructed its ELF Test Facility in the Chequamegon National Forest south of Clam Lake, Wisconsin. This consisted of 28 miles of antenna cable strung above ground on poles -- two 14-mile segments laid out as a cross to provide bi-directional transmission.

After many false starts on ELF expansion, the Reagan Administration on 8 October 1981 directed the Pentagon to plan the present concept of ELF, called Project ELF, which upgraded the Wisconsin facility and installed a second transmitter with antenna at K.I. Sawyer Air Force Base in upper Michigan. The Michigan facility in Escanaba State Forest has 56 miles of above-ground antenna cable -- exactly double that of the Wisconsin facility. ELF became fully operational in 1991 with receivers in all submarines.

The underlying layers of hard, low-electrical-conductivity pre-Cambrian granite of Northern Wisconsin and Upper Michigan -- called the Laurentian Shield -- provide optimum substructure for ELF transmission. When current passes through the rock between the two grounded ends of the antenna it electrically forms the lower half of the antenna loop. In high conductivity rock the current will complete the loop in a shorter path and only penetrate a few hundred feet deep. In the Laurentian Shield it forms a loop some

FIGURE 3.1-1
ELF WAVE PROPAGATION



10,000 feet deep which radiates a much stronger signal for a given antenna current. (See Figure 3.1-1)

As the signal completes the loop deep in the earth, it resonates ELF signals between the earth and the ionosphere, which is a band of electrically charged particles in the upper atmosphere. This Schuman wave resonance, as it is called, reinforces and strengthens the transmitted signals, resulting in waves trapped between the earth and the ionosphere. The propagation loss is very low and relatively small signals can travel essentially all the way around the world. Whether they actually do or not depends on propagation conditions, the location of the transmitter, and the antenna layout.

When the ELF wave passes across the earth in this earth-ionosphere waveguide, it is dragged, or bent, along the earth's surface. The wave actually develops a horizontally polarized component and a vertically polarized component. (See Figure 3.1-1) The horizontal electric field can penetrate several hundreds of feet down into the earth or ocean.

US ELF transmitters operate at 76 cycles per second (Hertz, or Hz) and send messages by shifting down to 72 Hz or up to 80 Hz. A 76-Hz ELF wave has a length of approximately 2,500 miles (4,000 kilometers) which is difficult to jam and resistant to nuclear radiation blackout. It will form ten complete waves around the earth which is about 25,000 miles in circumference. These waves meet each other in phase and continue to reinforce one another as they rebound and resonate.

ELF waves travel at the speed of light but they are slow for communication because it takes time to build up resonance, or strength. Messages are sent in binary form by the shifting downward or upward. An ELF transmitter can shift 16 times per second. Each shift is called a "bit" of information. It takes 5 bits arranged in various combinations to make one letter of the alphabet.

Since the ELF transmitter can send 16 bits of information a second, it would seem that it could send slightly over 3 letters per second. This does not happen because the signal would be too weak to penetrate the ocean. Each signal has to be repeated many times to build up sufficient resonant strength. How many times, or how long it takes, depends chiefly on the size of the antenna grid. The present US ELF will barely transmit one bit per minute -- about five minutes to send one letter.

A system of 3-letter codes provides 17,576 pre-designated messages. (With 26 letters in the alphabet: 26 x 26 x 26 = 17,576) Project ELF takes about 15 minutes to send such a message. Two letter codes provide 676 messages (26 x 26 = 676) which take ten minutes to send.

ELF communication coverage to the required ocean depth is somewhat governed by strength of the signals, but propagation factors play a more dominant role. Speed of transmission, however, could be traded off for depth under given conditions. During a crisis, submarines could be brought closer to the surface and ELF messages could be sent faster.

ELF transmitters operate continuously whether there are messages to send or not. This serves two purposes. One is that continuous transmission won't tip the Navy's hand by an increase of activity when a real message is sent. The other is known as "fail dead" -- that is, if transmissions should cease for any reason it would be a signal for the submarines to send an antenna to or near the surface to determine what is happening. It would put the entire submarine force on high alert. The first Trident submarine, *USS Ohio*, went on its first patrol in 1982 with an ELF receiver and "performance was better than expected." [See Nagler] Neither is ELF exclusively for instructing ballistic missile submarines. In early 1983 Admiral Nagler stated: "ELF is for both the ballistic missile submarines and the attack submarines. It will free those submarines from staying close to the surface in order to receive communications." [HASC-84, Part 3, p. 858.]

Since the transmitter-antenna complex is modular, it can be expanded to increase speed. One means of quick expansion is with a mobile system using trucks and trailers -- variously referred to as "Mobile ELF", "Elusive Voice" and "Transportable ELF." As of early 1982, five million dollars had been appropriated to investigate this possibility [Stop Project ELF newsletter, p. 6.] which could eventually consist of a fleet of trucks and trailers carrying thirty miles of ELF cable, transmitters, generators, security equipment, and radiation protection equipment. Deployment would probably take place in Wisconsin and Michigan. [Stop Project ELF newsletter, p. 6.] During time of emergency these trucks would unravel the cable in segments and connect them to form a 30-mile antenna element.

Another form of rapidly deployable ELF is the so-called "Balloon ELF." In early 1978 Pentagon officials referred to a proposal to use balloons for lifting an array of vertical antennas. [HAC-79, Part 4, p. 507.] The Navy in 1981 contracted with Pacific-Sierra Research Corporation of Santa Monica, California to study Balloon ELF's feasibility. [*Defense Daily*, 25 Jun 81, p. 306. Also see *AW&ST*, 6 Jul 81, p. 63.] In his fiscal year 1985 Defense Advanced Research Projects Agency (DARPA) report, director Dr. Robert S. Cooper referred to a VLF/ELF transportable communication system using a balloon-supported vertical dipole antenna. [DARPA-85, p. III-16.] Field tests were completed by October 1987 when an aerostat lifted more than 12,500 feet of antenna. [*AW&ST*, 19 Oct 87, p. 129.]

ELF will not survive a nuclear attack. [HAC-79, Part 4, p. 491.] It is even vulnerable to conventional sabotage. There would simply be no ELF left to call up submarines for second-strike retaliation under the public policy of deterrence. For striking first, however, ELF would play a vital role -- or if the submarine were part of a nuclear expeditionary force under the New World Order. Congressional transcripts are replete with testimony saying ELF is a "bell ringer" to bring submarines to the surface where targeting and launch instructions can be sent by other means. [HAC-79, Part 4, p. 501; HASC-84, p. 991; HASC-85, Part 2, p. 666 and Part 5, p. 178; SASC-85, Part 2, p. 936; HASC-86, Part 7, p. 386; and HAC-87, Part 3, p. 496.]

Communication with the submarines of US allies could also be enhanced. The British once considered an ELF transmitter in Northern Scotland where the Caledonian Granites meet transmission requirements. [See Spaven] From this location ELF messages could better reach submarines in the Arabian Sea. However, the Scotland ELF has not been pursued. Britain will have to rely on the US transmitter to call up its submarines.

Project ELF is a dangerous system which will significantly contribute to the destabilizing offensive capability of the United States and its allies. Global security would be enhanced if ELF were cancelled and existing facilities dismantled.

B. TACAMO

The US has a network of land-based VLF transmitting stations around the world to provide one-way communication with submarines. These are known as the Fleet Broadcasting System. But since ground-based communications are probably the most vulnerable of military targets, TACAMO (an acronym for "Take Charge And Move Out") was developed as a nuclear-survivable alternative. The submarine would put an antenna close to the surface at prescribed times to receive messages.

The TACAMO aircraft is a flying broadcasting station. The older models have been replaced with the E-6A aircraft, a Boeing 707 derivative. As of mid-1991, ten of the sixteen airplanes planned had become operational. They are based at Tinker Air Force Base in Oklahoma. When transmitting, the plane reels out a five-mile-long, 0.16-inch-diameter antenna while flying the so-called orbit maneuver -- a tight circle at low speed (30-50 degree bank angle at approximately 150 knots). This allows the antenna to fall almost vertical. The emitted VLF waves travel vertically in the atmosphere. They also have horizontal components, as described for ELF waves above, that penetrate sea water some forty feet to be picked up by a long antenna trailed by the submarine.

Since ELF has been fully deployed, and especially since the cold war ended, TACAMO gave way to budget pressure and was taken off airborne alert. There used to be two aircraft flying continuously, one over the Pacific Ocean and the other over the Atlantic. TACAMO aircraft are now on 24-hour strip alert, ready to take off immediately in a crisis. As MILSTAR satellites become operational, the ELF-MILSTAR combination could well relegate VLF communications to routine message delivery.

C. MILSTAR

Just prior to launching missiles there would be no danger in putting an antenna on the surface to pick up more rapid satellite transmissions -- both for communication and to determine the submarine's true position from NAVSTAR navigation satellites. In April 1983, then DARPA Director Robert Cooper revealed that submarines are also being equipped with extreme high frequency (EHF) receivers. "That combination of ELF bell-ringer and the EHF capability," he said "should provide appropriate communication to our submarines in the latter part of (censored). [HASC-84, Part 5, p. 991] It is now known that the censored date is the latter part of the 1990s. In May 1986, Assistant Navy Secretary Melvyn R. Paisley confirmed that missile-launching submarines will be able to receive MILSTAR satellite EHF messages. [SAC-87, Part 2, p. 230.]

It is no great risk to use rapid EHF communication to send missile launch instructions to the submarine because avoiding detection is a moot point at the time of launch. The submarine must approach the surface anyway to get a position fix from navigation satellites. Also, missiles cannot be launched from great depths or while the submarine is moving (unless it has surfaced). The hovering system required to stabilize the submarine at essentially zero speed prior to launching missiles would be far more detectable than an

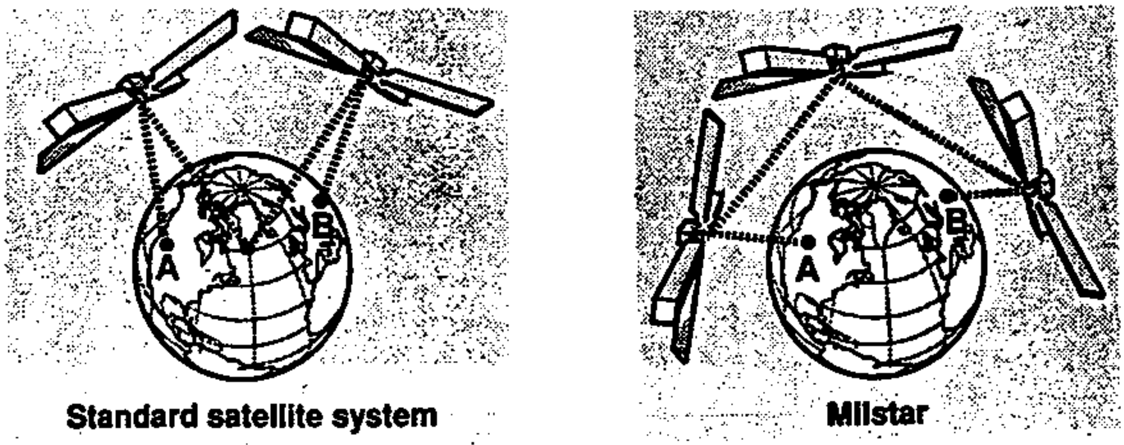


FIGURE 3.1-2
COMMUNICATIONS SATELLITE CAPABILITIES
Source: San Jose *Mercury News*
To send between "A" and "B" the standard system must relay through a ground station. MILSTAR does not.

antenna on the surface.

Before proceeding with MILSTAR, I should mention other satellite communications systems. There are two constellations of military communications satellites presently in geosynchronous orbits -- the Fleet Satellite Communications System (FLTSATCOM) and its follow-on, and the Defense Satellite Communication System (DSCS). In addition, the Air Force Satellite Communications (AFSATCOM) system has communication transponders riding piggy back on other satellites. There is also the Arctic Satellite communications system (ARCTICSATCOM) which has a highly-elliptical orbit. It swoops low to within a couple hundred miles of the earth around the south pole and then climbs to a very high apogee over the arctic. ARCTICSATCOM spends most of its time over the northern hemisphere and provides better communication at the northern latitudes than do FLTSATCOM and DSCS which are in earth-synchronous orbit over the equator. Several ARCTICSATCOMs equally spaced would provide continuous communication coverage in the arctic.

Later models of FLTSATCOM and DSCS may have some EHF capability but that seems to be mainly for development testing and to eventually tie in with MILSTAR. Nevertheless, these satellites could, and probably do, communicate with submarines having an antenna on the ocean's surface.

Design of the Military Strategic and Tactical Relay (MILSTAR) satellite started early in the 1980s at Lockheed Missiles & Space Company. There have been technical problems, design changes, cost increases, and schedule delays. Over the 12 years leading up to 1994 the Pentagon had invested about $8 billion in the MILSTAR program. Each MILSTAR put in orbit is expected to cost about $1.3 billion -- $1 billion for the satellite and $285 million for the Titan-4 rocket that launches it. $648 million was requested for MILSTAR during fiscal year 1995, down from $918 million in 1994. The entire program was originally estimated to cost $17 billion.

Originally MILSTAR was designed to operate at a low data rate (75-2,400 bits/second) for sending launch instructions to strategic nuclear forces. Those are the best rates for sending teletype and compressed-voice communications. But for tactical operations, such as in regional wars, this is not adequate. A medium data rate of between 4,800 and 1.5-million bits/second is required for regular voice communications and imagery. Therefore, with the end of the cold war, Congress directed in the fiscal year 1991 military budget that MILSTAR be restructured or an alternative advanced communications satellite program be commenced.

The Pentagon chose to restructure MILSTAR. To reduce cost it cut the planned eight-satellite constellation to six, reduced the amount of ground-based equipment, and eliminated several systems survivability features (such as nuclear electromagnetic-pulse shielding). To support tactical operations it scheduled the medium-data-rate capability for satellite number 4 and after.

In October 1992, again based on pressure from Congress, the Pentagon further reduced the planned constellation of satellites to four. The plan at that time was to launch the first two with the original low-data-rate design and then pick up the medium data rate on satellite number 3.

A year late, after the October 1993 bottom-up review of major weapons programs, the Pentagon held the constellation size at four but limited total production to six. The first two, known as MILSTAR Block-1, would be low data rate only. The next four, known as MILSTAR Block-2, would have both low and medium data rate. Presumably the last two Block-2s would replace the two Block-1s. Block-2 will have 100 times the tactical communications capacity of Block-1. Starting in 2006, to reduce long-term costs, the Pentagon plans to start replacing MILSTAR Block-2 satellites with an enhanced MILSTAR -- an advanced-capability, smaller satellite which can be boosted into space with a smaller rocket.

The first MILSTAR satellite was put into orbit on 7 February 1994 -- about seven years behind original schedules. The second satellite is slated to be launched in May 1995. Satellites numbers 3 and 4 are in development and scheduled for launches in 1999 and 2000.

Contracts have not been awarded for the 5th and 6th MILSTAR satellites which are scheduled for launch in 2001 and 2002 respectively. The GAO has pointed out that these last two could be cancelled and existing technology would support advancing the schedule for enhanced MILSTAR, which could be deployed in 2003 rather than 2006. The money saved by doing so would exceed $2 billion. [GAO/T-NSIAD-94-164, pp. 1 & 6-7]

Present plans call for four MILSTAR satellites in geosynchronous orbit -- an orbit about 22,300 miles above the equator which is synchronized with the earth's rotation so the satellites appear to be stationary in the sky -- and some capability for communication in the northern latitudes. The latter could be accomplished by putting MILSTAR payloads piggyback on existing satellites. MILSTAR will provide secret and jam-resistant EHF communication between any two places on earth. It will be the first system to provide such communication 24 hours a day. It will also be the first space constellation capable of relaying messages between satellites to eliminate dependence on ground stations.

When three MILSTAR satellites are in orbit the system will be considered fully operational. Transmission from a ground command post, ship, or aircraft will be received by the nearest satellite, relayed to the satellite closest to the message's destination, and then transmitted back down to the recipient. With on-board data processing, each of these 5-ton spacecraft will be relatively autonomous.

MILSTAR is a dangerous addition which will make America's war machine more aggressive. It should be cancelled to lessen world tensions. FLTSATCOM, DSCS and AFSATCOM provide all the communication necessary for defensive operations.

Lockheed Missiles and Space Company is the prime contractor and has about 1,000 people working on MILSTAR. TRW Space and Electronics Group provides the low-data-rate payload, Hughes Aircraft Company will supply the medium-data-rate payload for the Block-2, and Martin Marietta Corporation makes the Titan-4 launch vehicle with the wide-body Centaur upper stage.

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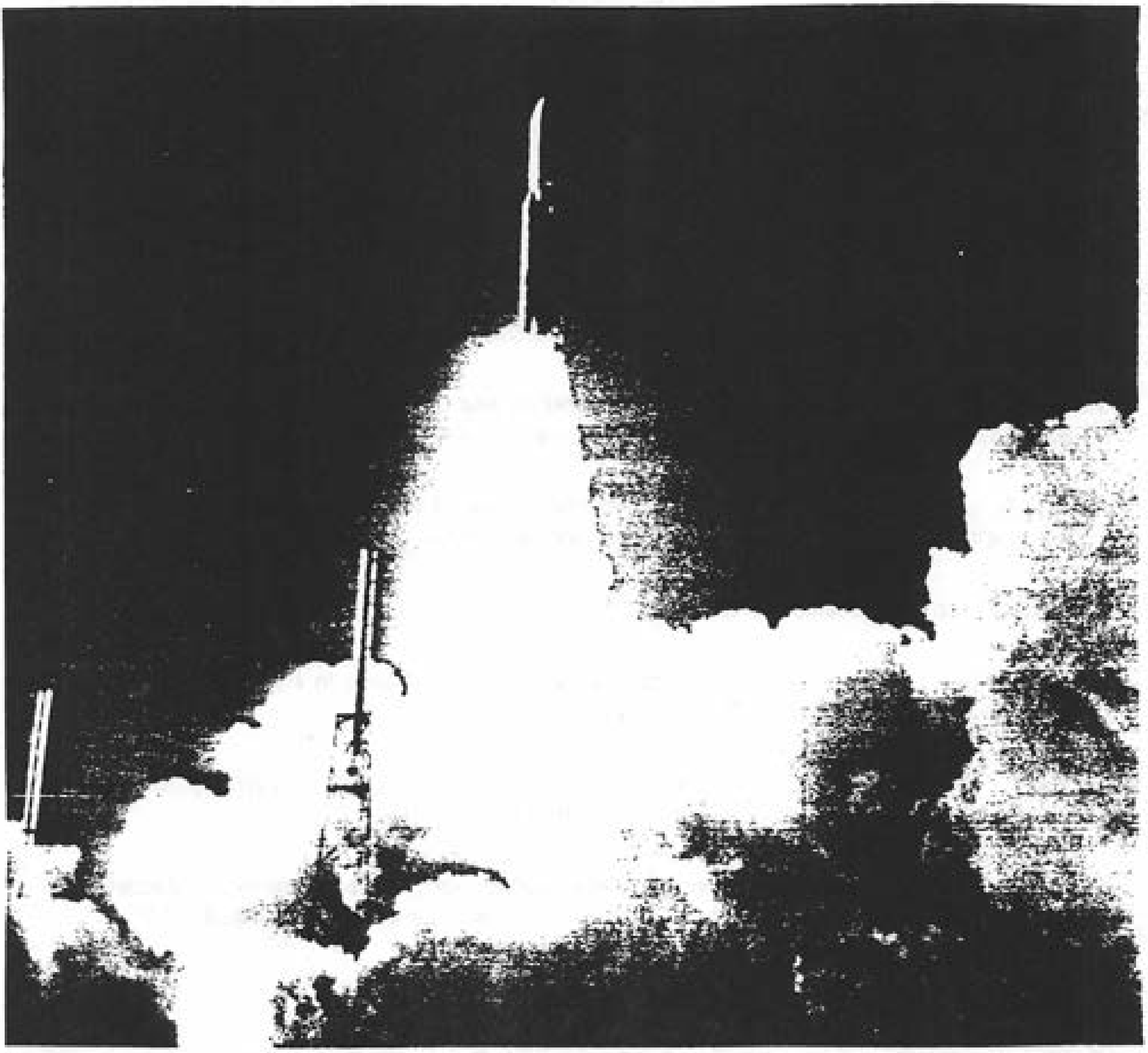

MILSTAR satellite in a shroud atop a Titan-4 booster blasts off from Cape Canaveral
Source: *LMSC Star*

3.2 NAVIGATION: STRAIGHT AND TRUE

Submarines, like missiles, have an inertial navigation system comprised of instruments which sense every movement of the vessel as well as tides and currents. By keeping track of all this relative motion the navigation system provides a pretty fair location of the submarine over a given period of time. But the margin of error increases with time and the sub needs a navigation *fix* to update its exact location. Then the corrected inertial system continues for another increment of time. Prior to the 1990s, submarines relied on land-based Omega and Loran-C signals, and Transit navigation satellites for these periodic positional fixes. Now the NAVSTAR global positioning system is taking over.

A. OMEGA, LORAN-C, AND TRANSIT

Omega is a very-low-frequency (VLF) system with eight transmitting stations spread throughout the world to provide global coverage. Every ten seconds each of these stations emit a unique beep, but they are not emitted simultaneously or haphazardly. Through the use of very accurate and precisely synchronized atomic clocks, these beeps are emitted in a prearranged sequence at a specific time. A submarine can raise an antenna to within 30-40 feet of the surface to receive at least three of these stations at any time. By knowing when the beep is emitted and recording, by means of an on-board atomic clock, the time it is received, the submarine's navigator can calculate how far the boat is from each station. Then it is merely a matter of trigonometry to determine the sub's position. Of course this is all done automatically by computer. Omega is accurate to within 3,000 feet. An improvement called Differential Omega can improve the accuracy to several hundred feet. In this system a nearby land station of known location determines the error accumulated during the travel of the radio signal, and then broadcasts local correction factors. But such stations are limited and even Differential Omega is not accurate enough for destroying hard targets.

Loran-C uses land-based transmitters to send out signals in the low-frequency (LF) band. Most areas of the world are covered but to receive these fixes a submarine has to put an antenna within 9-12 feet of the ocean's surface. Loran-C fixes are accurate to within 250-500 feet -- still not good enough for hard-target missiles.

Finally, there are Transit navigation satellites which can also transmit in the LF band but are only in view of a specific submarine's location every hour or so. Then a submarine must leave its antenna within 9-12 feet of the surface for three to four minutes in order to get a fix from different positions of the single satellite in view. Transit accuracy is anywhere from 150 to 600 feet, which is still not good enough.

It was because of this lack of precision in navigation aids that submarine-launched missiles never had the accuracy of land-based ICBMs. A faster and more accurate system was needed to make Trident a first strike weapon. The answer was the NAVSTAR Global Positioning System (GPS).

NAVSTAR GPS

In *First Strike* (Aldridge, 1983), the history and function of the Navigation System Timing And Ranging (NAVSTAR) is outlined. NAVSTAR is now available at any time, in any weather, and at any place on or above the earth. A 30-second fix gives the receiver's position within 10 meters (33 feet) in all three dimensions, and velocity (speed and direction) within a fraction of a mile per hour. Navstar also provides precise time within a millionth of a second to synchronize the submarine's atomic clock.

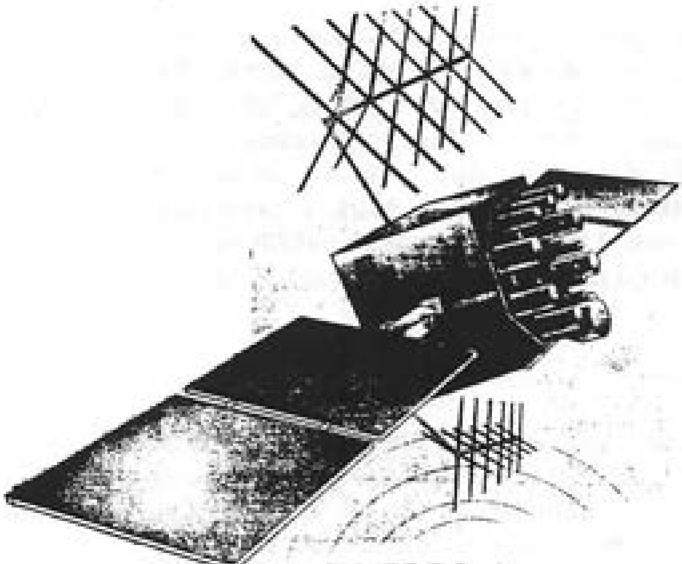

FIGURE 3.2-1
NAVSTAR SATELLITE
Source: San Jose *Mercury News*

A more accurate application of NAVSTAR is available at certain critical locations. Called Differential NAVSTAR, it provides 3-dimensional accuracy within 2 meters (6.6 feet). To accomplish this a receiver of precisely known location receives the NAVSTAR signals, calculates the error, and then broadcasts a correction factor for that locality. For civilian use, however, the Pentagon will only provide navigation fixes with an accuracy of 100 meters (330 feet) in all three dimensions.

The full NAVSTAR constellation consists of 24 operational satellites. They are divided equally in six polar orbital planes inclined 55 degrees to the equator. The orbits are approximately half-geosynchronous (10,898 nautical miles above the earth), which means each satellite completes about two trips per day around the globe. With this full constellation there will always be five satellites in view. The satellites have about a 7-year service life. NAVSTAR satellites are now being put into orbit by Delta-2 rockets launched from Cape Canaveral. Falcon Air Force Base in Colorado is the master control station for NAVSTAR, which was used extensively during the war with Iraq. The first Block-2 operational satellite was launched into orbit on 14 February 1989. All Block-2 and Block-2A satellites, built by Rockwell Space Systems Division (Downey, California), have now been launched into orbit.

In 1989 the US Air Force awarded a contract for 21 replacement satellites designated Block-2R. Lockheed Martin Missiles & Space Company (LMMS -- Sunnyvale, California) will deliver the first of these in 1996. They are also expected to last about 7 years in space.

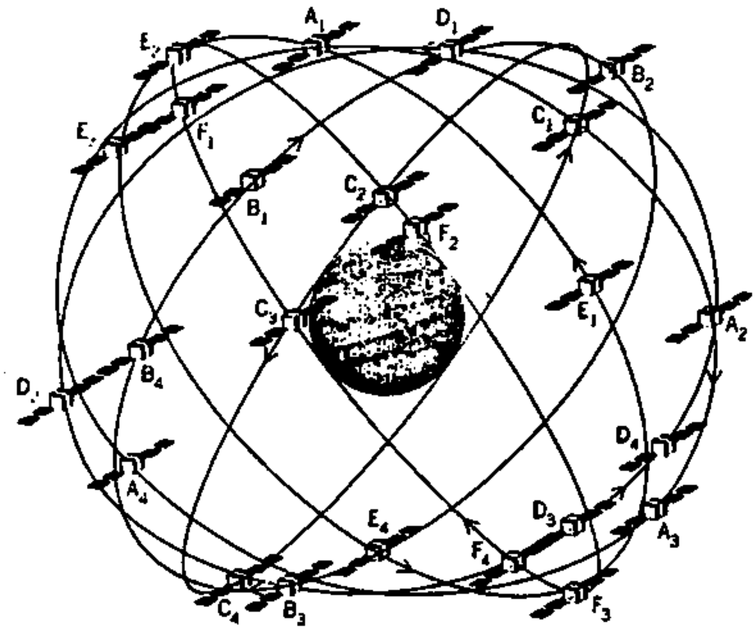

FIGURE 3.2-2
FULL NAVSTAR CONSTELLATION
Source: Unknown

LMMS is preparing a proposal for a third generation NAVSTAR called Block-2F. They will have more auxiliary payload space and last about 10 years. Originally the Air Force wanted 51 of the Block-2Fs but in mid-1995 that was scaled back to 33. Besides LMMS, Rockwell Space Systems Division and Hughes Space & Communications Company (Los Angeles, California) are competing for the contract.

Obtaining the navigation fixes from NAVSTAR is, again, a sophisticated exercise in triangulation. Extremely precise atomic clocks time the intervals between transmission and receiving of radio signals from each of the satellites in view. A computer then solves four or five simultaneous equations to obtain the receiver's position. Subsequent readings provide speed and direction.

NAVSTAR, by giving the exact position of launch, is the answer to submarine-launched missile accuracy. NAVSTAR receivers could also be in the missiles, themselves, to provide in-flight missile guidance updates for even greater precision. Both Trident-1 and Trident-2 missiles have received NAVSTAR signals during test flights, purportedly to calibrate the on-board navigation system. But millions of dollars have been spent to integrate NAVSTAR fixes with inertial navigation packages and it would be no great effort to do that for Trident. NAVSTAR has already been incorporated on cruise missiles (21 inches in diameter) and receivers have been designed for use in 155-millimeter artillery shells (six inches diameter. Some NAVSTAR receivers are as small as cigarette packages, so space and weight are not problems. NAVSTAR updates would only be necessary for Trident-2 missiles carrying the smaller and lighter 100-kiloton warheads, so weight is definitely not a problem. Regarding space, the receiver is so small it could be installed almost anywhere on the reentry vehicle deployment platform (bus) to aim each warhead directly at its target.

* * * * *

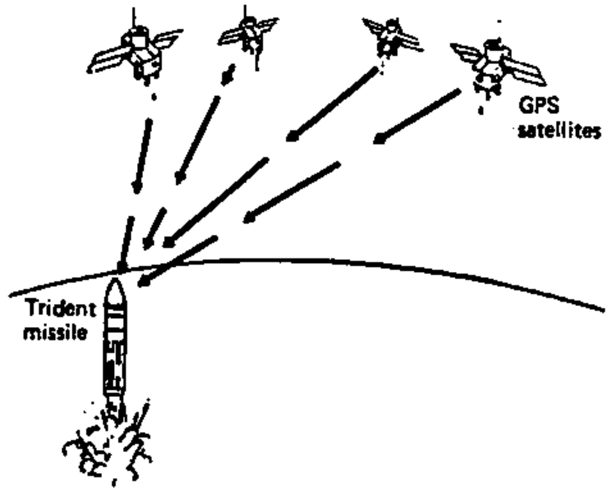

FIGURE 3.2-3
TRIDENT MISSILE RECEIVING NAVSTAR SIGNALS
Source: Thompson

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4

SECTION 4
TRIDENT
DEPLOYMENT

4.1 US BASES: BANGOR AND KINGS BAY

US Trident submarines are based at two locations -- Sub-Base Bangor in Washington state on the west coast, and Sub-Base Kings Bay in southern Georgia on the east coast.

Sub-Base Bangor on the Hood Canal was the first Trident home port established. It is in Kitsap county across Puget Sound from Seattle. Submarine access to the base is from the Pacific Ocean through the Strait of Juan de Fuca and up the Hood Canal. The first Trident submarine, *USS Ohio*, arrived at Sub-Base Bangor on 12 August 1982. A full compliment of eight Trident submarines now operate out of that port. All are armed with Trident-1 missiles.

Sub-Base Kings Bay, the east-coast home port for US Tridents, is on the Cumberland Sound -- in Camden County a short distance from the town of St. Marys. Submarine access to the base is from the Atlantic Ocean through Cumberland Sound. The first submarine at this base was the *USS Tennessee* which arrived on 15 January 1989. As of the end of 1992 five Trident submarines were operating out of Sub-Base Kings Bay. The full compliment of ten is scheduled to be achieved by the end of the 1990s.

Sub-Base Kings Bay is also the forward base for US Poseidon submarines carrying Trident-1 missiles. (Their home port is Charleston, South Carolina.) They are serviced by a tender ship and floating dry dock anchored in the water, not by the land facility which is only for Trident submarines.

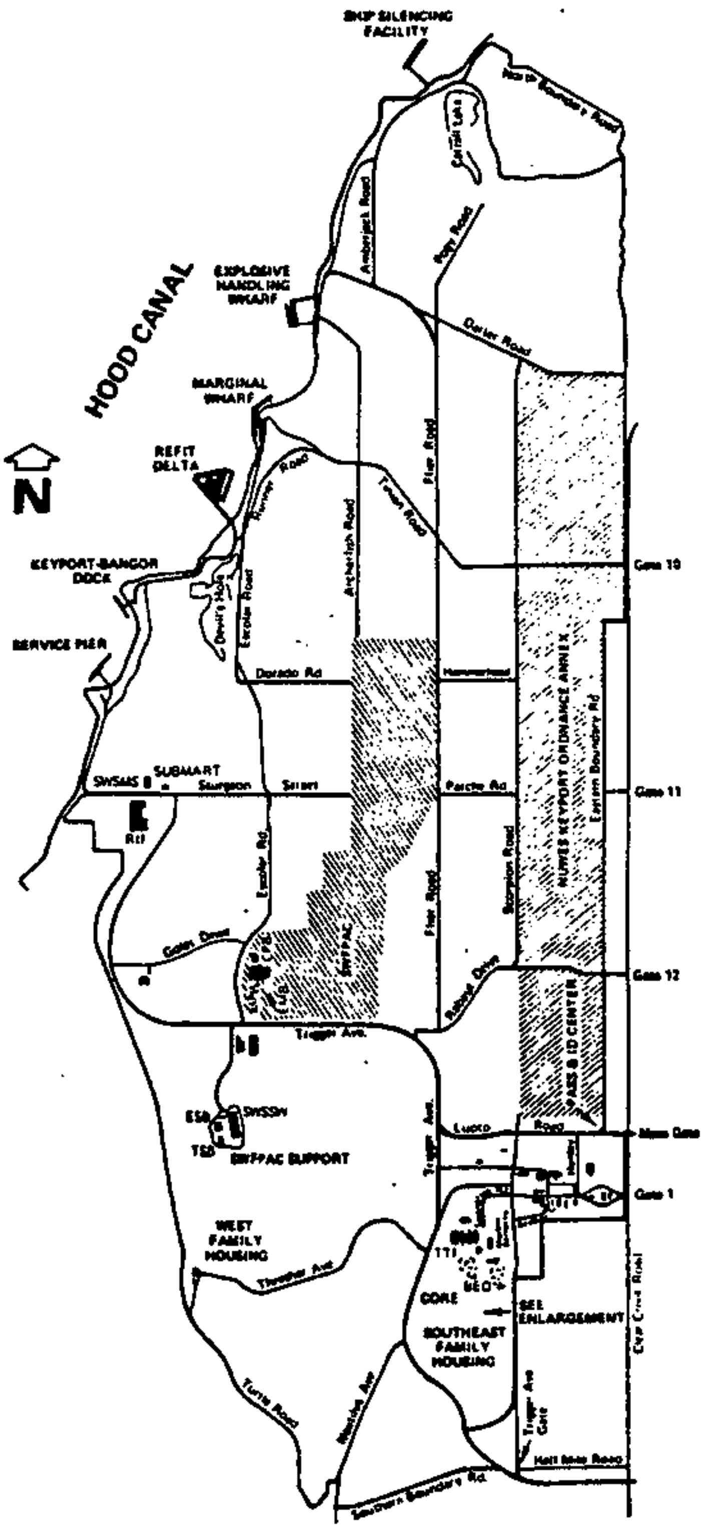
Figures 4.1-1 and 4.1-2 are maps of the two home ports for Trident submarines.

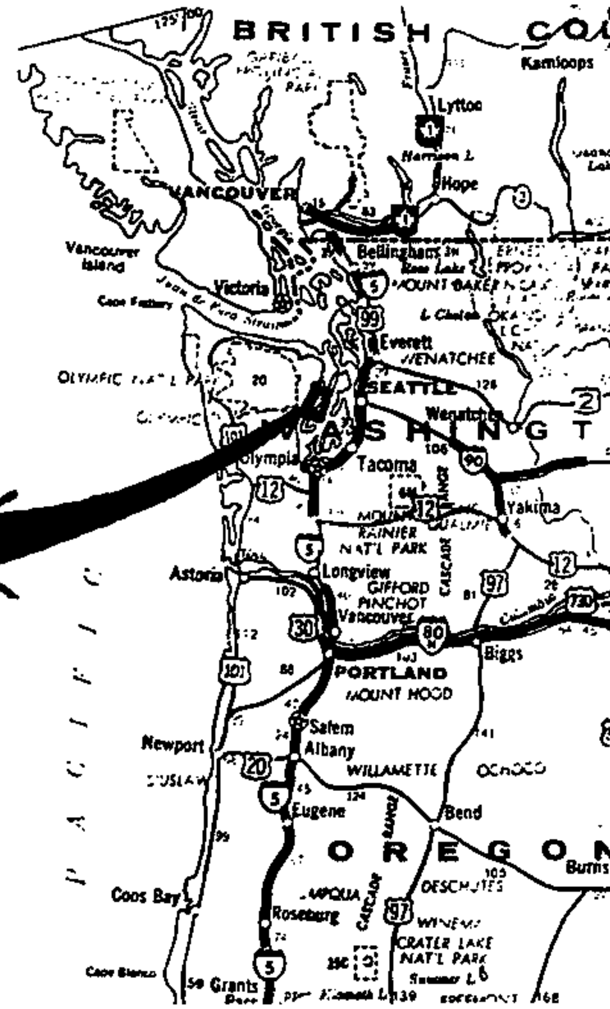
* * * * *

[MORE INFORMATION ON THIS SUBJECT WOULD BE WELCOME]

FIGURE 4.1-1

MAP OF US WEST-COAST SUB-BASE BANGOR

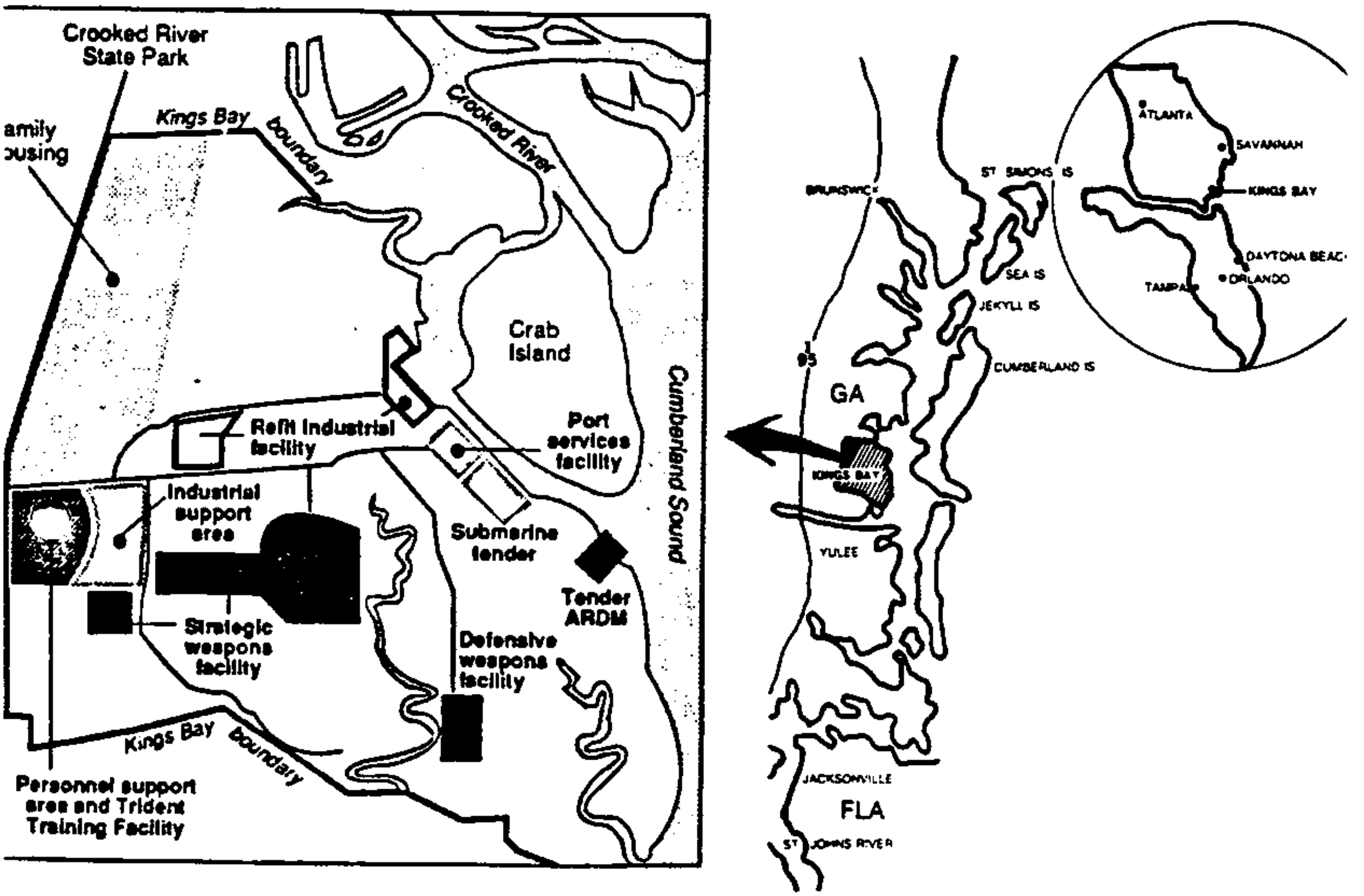




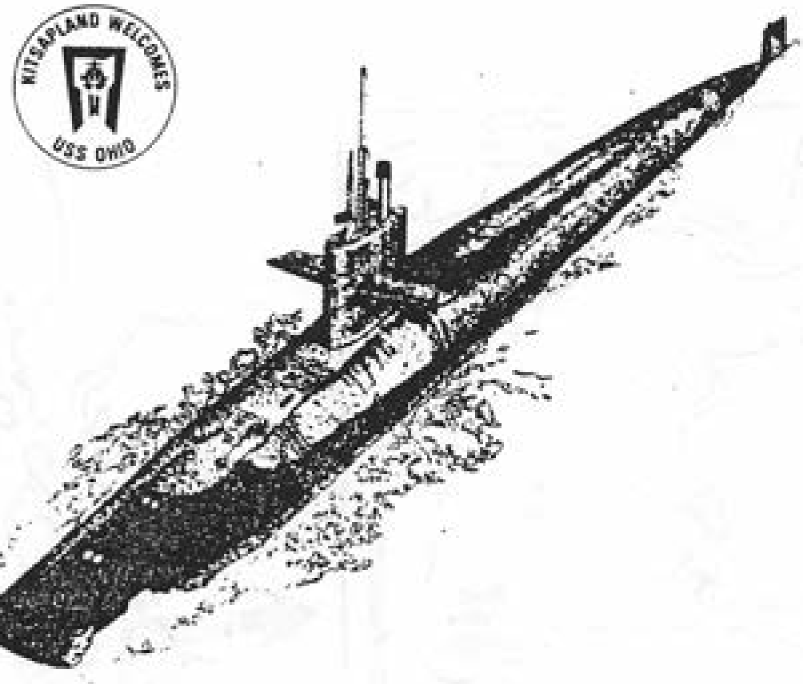
SOURCE: US Navy
Ground Zero Center for Nonviolent Action

FIGURE 4.1-2

MAP OF US EAST-COAST SUB-BASE KINGS BAY



SOURCE: US Navy
The Florida Times-Union
Metanoia Community


KITSAPLAND WELCOMES
USS OHIO


Employment Opportunities
U.S. NAVAL
TRIDENT COMPLEX
KINGS BAY, GEORGIA

4.2 BRITISH BASES: FASLANE AND COULPORT

British Clyde Sub-Base Faslane and RNAD Coulport are located along inlets, or Lochs, off the Firth of Clyde. The former is on Gare Loch and the latter on Long Loch. The next inlet toward the mouth of the firth is Holy Loch where US missile launching submarines were once forward based. (See Figure 4.2-1) The US forward base at Holy Loch was closed in November 1991.

RNAD Coulport is basically a weapons depot. That is where the warheads are stored, and where they are installed and removed from the submarine. It is also the storage and loading/unloading port for torpedoes. For Polaris submarines, the missiles are also loaded, unloaded and stored at RNAD Coulport. For Trident missiles this would normally be done at Sub-Base Kings Bay in the US, but RNAD Coulport will have the facilities if needed.

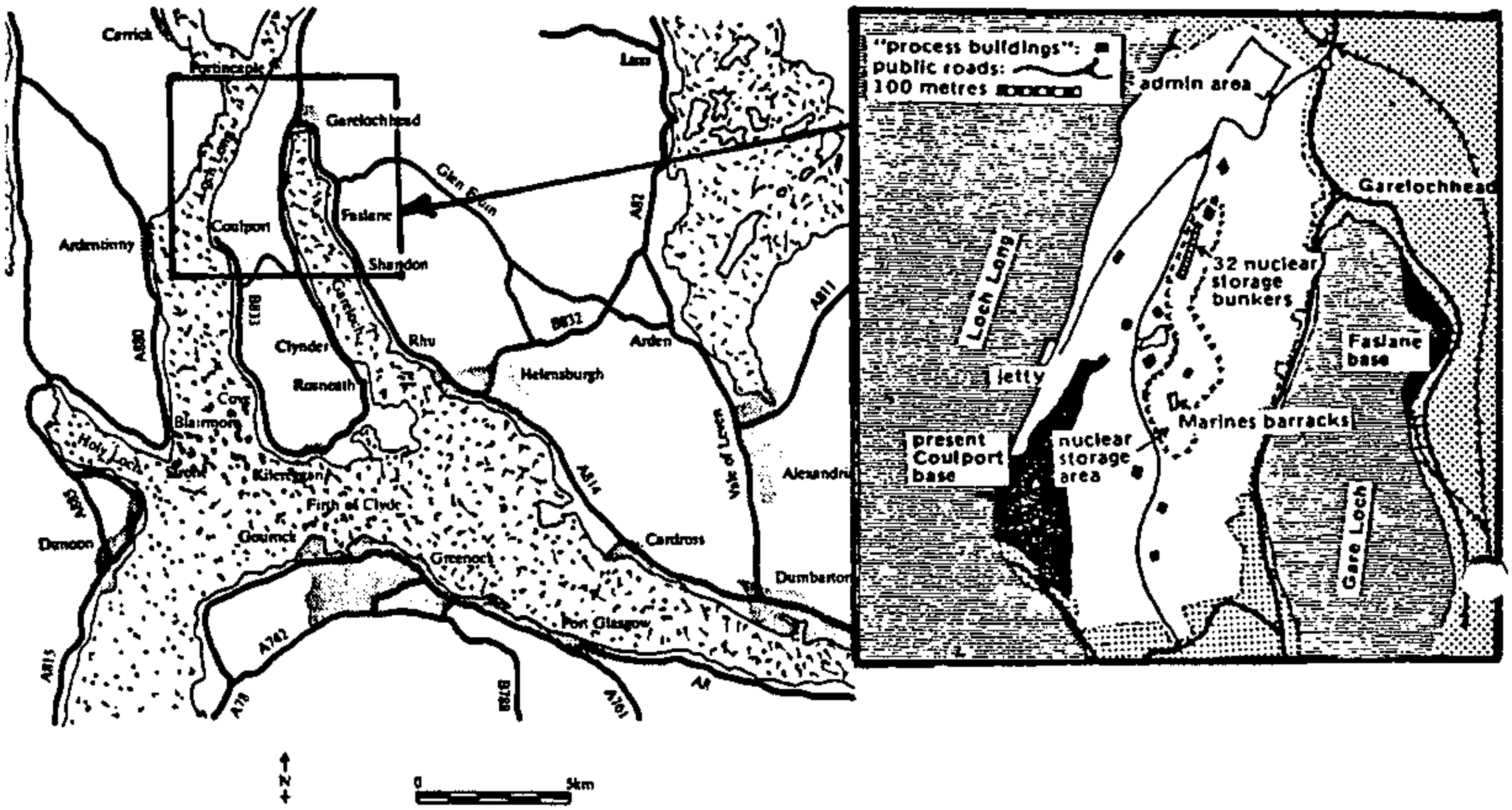
Sub-Base Faslane handles the submarine refitting and routine maintenance between patrols.

* * * * *

[MORE INFORMATION ON THIS SUBJECT WOULD BE WELCOME]

FIGURE 4.2-1

MAP OF BRITISH CLYDE SUB-BASE FASLANE AND RNAD COULPORT



SOURCE: *Peace News* (Britain), September 1982, p. 3.
Third Report of the Defence Committee, House of Commons, Session 1986-87, p. xi.

4.3 FORWARD DEPLOYMENT: POISED FOR THE KILL

Trident's presence has or will spread to the southwestern Pacific and Indian Oceans. The additional ocean area in which the submarine can operate has always been the paramount justification for the Trident system. Covering more of the globe has become even more compelling with the strategic policy shift toward regional conflicts. But when patrolling off the Bay of Bengal or the Arabian Sea in crisis times, the Navy certainly wouldn't want to send the sub all the way back to Bangor for periodic resupply and refit. There would have to be means of forward basing or servicing.

Although plans for a Trident base in Micronesia are hotly denied by Navy officials, the obvious advantages coupled with official statements and actual naval exercises indicate secret ambitions for such bases. Likewise for Diego Garcia in the Indian Ocean. All that is necessary to establish a forward base is for a submarine tender ship to steam in and drop anchor. The US Navy's inventory of SSBN tender ships is shown in Figure 4.3-1.

FIGURE 4.3-1

US SSBN TENDER SHIPS

NAME	DESIGNATION	COMMISSIONED
USS Proteus	AS 19	8 Jul 1960
USS Hunley	AS 31	16 Jun 1962
USS Holland	AS 32	7 Sep 1963
USS Simon Lake	AS 33	7 Nov 1964
USS Canopus	AS 34	4 Nov 1965

All were built from scratch except *USS Proteus*, which was converted from another ship to meet the early needs of Polaris submarines. According to a US Navy document, *USS Proteus* was retired in 1981 when Polaris missiles were taken out of service, and it is scheduled to be decommissioned at Puget Sound Naval Shipyard in Washington state -- starting in September or October 1992 and taking about one year. But as we shall see below, this ship has continued to support forward refits. The USS Hunley (AS 31) is scheduled for decommissioning in 1994. [*New London (CT) Day*, 19 February 1993]

A. FORWARD DEPLOYMENT IN THE ATLANTIC

The other four FBM tenders were converted to handle Poseidon C-3 missiles. Later the *USS Simon Lake* and *USS Canopus* were again refitted to also have a Trident-1 (C-4) capability (and possibly a Trident-2 D-5 capability). They have been stationed at Holy Loch (Scotland) and Kings Bay (Georgia), respectively, to service Poseidon subs. According to the US Navy, Holy Loch is the forward base for Poseidon subs carrying Poseidon missiles, and Kings Bay is the forward base for Poseidon subs carrying Trident-1 missiles. The home port for both classes of submarines is Charleston, South Carolina. However, the *USS Simon Lake* at Holy Loch gave that forward base a Trident capability. Since the subs carry no markings, observers could not determine their identity and what missiles were inside.

In November 1991 the Holy Loch base was closed. The *USS Simon Lake* is now free to transfer to the Pacific where Trident submarines carry Trident-1 missiles. When the remaining Poseidon subs are retired, which we are told will be soon, *USS Canopus* will also be able to operate in the Pacific or Indian Oceans.

B. SCOOP IN THE PACIFIC

As mentioned above, the original argument for the Trident program is that the longer range missiles will allow the submarine ten times the ocean area in which to patrol. When the discussion comes to forward bases to support the use of greater ocean area, the argument then shifts to the other foot -- the longer range missiles allow Trident subs to patrol close to home port and still be able to attack their targets. The Navy can't have it both ways.

Longer range missiles do allow the sub to be on-station as soon as it leaves home port. In early 1989 the *USS Alaska* went through a drill to the point of firing missiles right in the Hood Canal where Sub Base Bangor is situated. [*Seattle Post-Intelligencer*, 9 Feb 89, pp. A1 & A12] But full flexibility is never realized if the submarine stays at arms reach all the time. To achieve the short-flight-time advantage of SLBMs the submarine must be closer to its target. In addition, shorter (lofted) trajectories have a steeper reentry angle which minimizes the time to get back down through the atmosphere. That translates into less atmospheric disturbance and better accuracy. Better accuracy would be particularly true for a maneuvering warhead because it would be coming straighter down on its target and have more time to zero in.

So common sense tells us that the sub isn't going to hang around its own doorstep. We don't even have to rely on common sense because Naval exercises lead us to the same conclusion. In a program called SSBN Continuity Of Operation Program (SCOOP) various Trident subs in the Pacific have been refitted at remote locations. In May 1986 the *USS Georgia* went through a nine-day full refit at Guam. Guess which FBM tender was involved -- the *USS Proteus*. It may have been deactivated from supporting the Polaris fleet but it apparently remained at Guam. Although that exercise was described as a full refit, missiles were obviously not exchanged because the *USS Proteus* can't handle Trident-1s. (Perhaps it is because the *USS Simon Lake* has been freed from Holy Loch that the *USS Proteus* was finally scheduled to be decommissioned.)

Another refit of the *USS Georgia* took place at Guam in February 1987, to work out some problems encountered during the previous exercise. Following that the submarine *USS Nevada* was turned around at Sitka, Alaska. In July 1989 the *USS Alabama* went through refit at Astoria, Oregon, which created a local furor because it violated the county's nuclear-free-zone ordinance. Rear Admiral George W. Davis, former commander of Sub Base Bangor, said that changing crews, replenishing supplies, and performing needed repairs could also be done in Mexico. Trident subs under way in the open ocean have reloaded torpedoes from tender ships and taken on supplies from helicopters and supply ships.

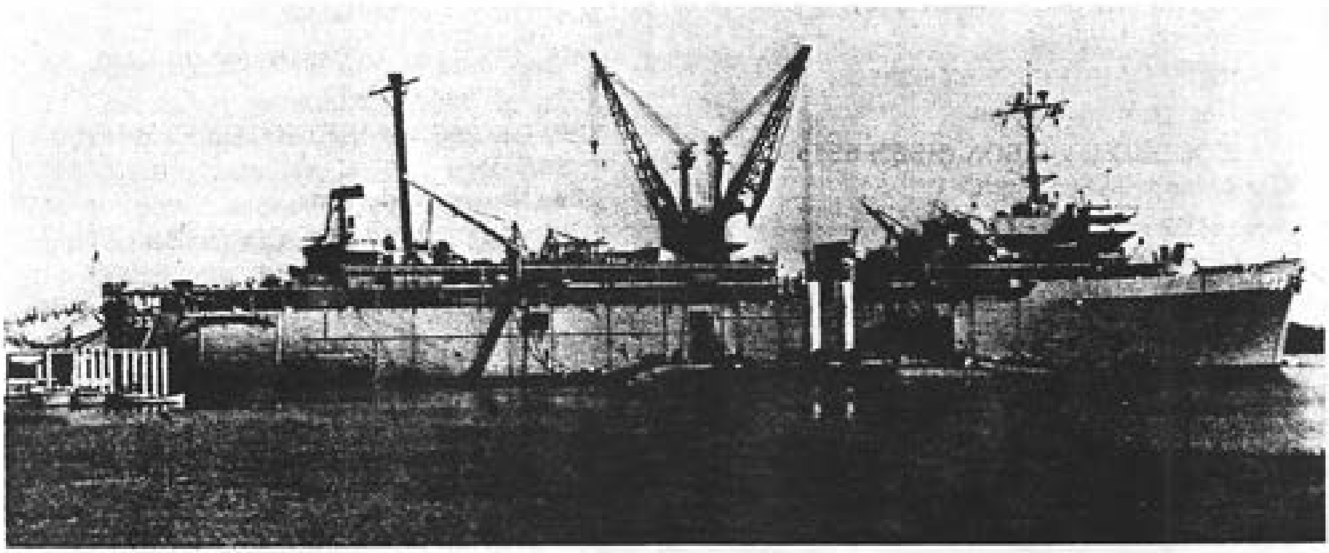


FIGURE 4.3-2
USS SIMON LAKE -- AS-33
Source: US Navy

SCOOP exercises can take place alongside any ship or at any wharf if missiles are not exchanged or reloaded. When missile handling enters the picture, the appropriate FBM tender must be available. I have seen nothing to indicate that the *USS Simon Lake* has been transferred to the Pacific, nor do I expect to see it announced, but I'll give good odds that is happening. Now let us look at a few possible sites for the real thing.

C. FORWARD BASES FOR THE PACIFIC AND INDIAN OCEANS

Numerous locations could be used as an anchorage for an FBM tender ship. One which I have suspected for some time is Palau's Malakal Harbor. Geographically centered in the Southwest Pacific, Palau (indigenously Belau) has the only harbor in the Pacific which would give Trident submarines two quick exits to the open ocean and the only harbor deep enough for submarines to dive while still in port. Located seven degrees above the equator and 500 miles east of the Philippines, Palau is aligned with the deep-water Sundra and Lombok Straits through which submerged submarines must travel to reach the Indian Ocean. Palau would be an optimum location for Pacific forward basing and a jumping off point for the Indian Ocean. [See *Resisting The Serpent* as an example of how the US tries to influence, control, and if necessary destroy people in order to enforce corporate and military plans.]

Singapore is another option since a 1990 accord allows US resupply ships to operate from that port. Repairs are also allowed at Singapore's commercial shipyards. Singapore's location at the head of the wide Strait of Malacca appears to be an ideal location for access to both the Pacific and Indian Oceans, but that is not necessarily the case. Although that strait is wide, it is shallow. Trident submarines would have to forgo stealth and travel on the surface. To remain submerged they would have to detour south and go through the Indonesian chain via the Sunda Strait.

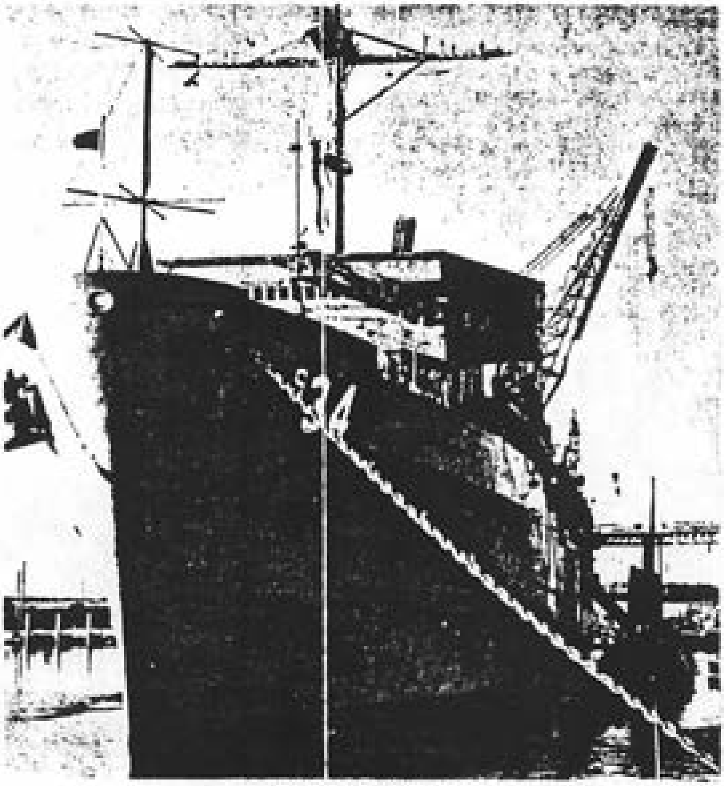


FIGURE 4.3-3
USS CANOPUS -- AS-34
Source: US Navy

In the Indian Ocean, itself, Diego Garcia is a logical refit site. It is, arguably, a British island under US control and has all the needed equipment. Possibly a tender ship wouldn't be needed, but it would still be desired for transporting extra missiles. Finding a berth at Diego Garcia would be no problem.

These are not the only potential sites to service forward-deployed Trident submarines. Any sheltered cove would suffice. As Rear Admiral J. Guy Reynolds, commander of submarine forces in the Pacific, remarked: "There may come a time when we won't have the luxury of returning to Bangor for a crew change or to refit the ship. So we practice in places far off the beaten track." [*The Sun*, 31 Jul 89] But there is no place "far off the beaten track" for Trident.

* * * * *

SECTION 5
THE HAZARDS
OF TRIDENT

5

5.1 SAFETY: CONSIDERATIONS AND CONSEQUENCES

Nuclear weapons are, at their best, dangerous to have around. At their worst they are a near occasion of widespread death and illness. During the design of many nuclear weapons and delivery systems the decision-makers chose performance over safety. Trident missiles, and Trident bombs, are among those cavalier choices. The three-member House Armed Services Committee Panel on Nuclear Weapons Safety, more commonly known as the Drell Panel, pointed out many problems which are discussed below. But the panel warned: The majority of the weapons in the current stockpile will have to be modified to meet [the specified and demanding safety criteria], unless they are retired. *Moreover, for some weapons we still lack necessary data to perform credible safety analyses.* (emphasis added) [Drell Report, p. 31]

A. THE WARHEAD PRIMARY: HANDLE CAREFULLY AND KEEP COOL

It should not have surprised us, then, when the Departments of Energy and Defense (DOE and DOD) in 1990 revealed safety flaws in the Trident-2 warhead, known by the DOE designation W-88. These problems are in the so-called primary -- the fission trigger which provides the temperature and pressure to set off the thermonuclear fusion reaction of a hydrogen bomb. This primary fission A-bomb is first set off by conventional explosives arranged in a hollow, spherical shell around the plutonium core, or "pit." The conventional explosives implode to squeeze and heat the "pit" to a critical mass, thus causing an instantaneous nuclear fission reaction.

The three-member House Armed Services Committee Panel on Nuclear Weapons Safety, more commonly known as the Drell Panel, announced in late 1990 that new computer models show "that unintended nuclear detonations present a greater risk than previously estimated (and believed) for some of the warheads in the stockpile." [Drell Report, p. 25]

1. One Point Safety.

The conventional explosive arrangement in the warhead primary is such that detonation at any one point would certainly burst the warhead case and scatter radioactive material, but it would not result in a nuclear explosion (yield). Thus, a sharp blow at any one point will not cause a nuclear yield. To obtain a yield, the detonation of the conventional explosive would have to be simultaneously at multiple points. One point safety (OPS) is required in all US nuclear warheads, and all are said to have that feature.

With the development of three-dimensional computer modeling of nuclear explosions, however, Dr. Sidney Drell says, "we were wrong in the assumptions about the location of the most sensitive point in the weapon at which a one-point detonation of the high explosive could initiate a nuclear yield. We also know very little about the risk of multi-point insults -- i.e. incidence of fragments nearly simultaneously -- causing a nuclear detonation." [Drell 1992 Testimony, p. 2]

2. *Insensitive High Explosives.*

Trident is not the first to have primary problems -- the original conventional-explosive triggers in Poseidon warheads were so touchy that a jolt of the missile could set them off. This *new* Trident problem is similar, and also concerns the chemical explosive trigger which Energy Secretary James D. Watkins, a retired admiral and former Pentagon Chief of Naval Operations, says he would never have chosen. If heated by a fire it would at best detonate and scatter radioactive material, or at worst result in a nuclear explosion. When airplanes crashed with or released the old nuclear bombs -- as they did in Spain, Greenland and North Carolina -- the bombs broke open and spread radioactivity, but there was no nuclear explosion. We have been lucky so far. But when a nuclear bomb is held in shape by a rugged reentry vehicle shell, and that bomb is heated to high temperature, it is more likely to trigger a nuclear blast.

Those warheads which present this newly emphasized danger are the ones using HMX-based explosive which is more sensitive to heat and impact. The insensitive high explosive (IHE) which is more resistant to temperature and shock is known as TATB. Although IHE was introduced into the stockpile in 1979, as of early 1992 less than 35 percent of the warheads had it, and neither Trident warhead falls in that category. After the September 1991 and January 1992 initiatives are implemented, the percentage with IHE will rise to about 65.

The reason IHE was not used in Trident warheads is because IHE has only about two-thirds the explosive power as the same weight of HMX-based explosive. Had IHE been used in the W-88 bomb, for instance, the bomb would have had less yield. It is interesting to note that the W-87 bomb for MX is the same as Trident's W-88, except that the W-87 has a yield of 330 kilotons instead of 475. Air Force officials once said that MX's yield could be increased if necessary. The W-87 has IHE and the W-88 does not. The conclusion is easy to draw.

The Mark-5/W-88 warhead is now only planned for use on four US submarines. It has been announced that the remainder will carry Mark-4/W-76 warheads. The Mark-4/W-76 warheads in Trident-1 missiles, and for use on Trident-2, are just as hazardous. They have highly-detonatable rocket fuel in all three stages and the warheads do not use IHE. This hazard was highlighted by Dr. Ray Kidder of Lawrence Livermore National Laboratory (LLNL): "These safety concerns apply equally to both the W-88/D-5 missiles currently being deployed and the far larger number of W-76/C-4 missiles already deployed, a point largely overlooked by the Drell Panel." [Kidder-1991/1, p. 5] Kidder goes on to explain that replacement of the W-76 warheads with warheads using IHE would probably require a new warhead to be designed and tested. In that light, production of the W-88 warhead was cancelled largely because manufacturing facilities at Rocky Flats was closed, rather than for safety concerns.

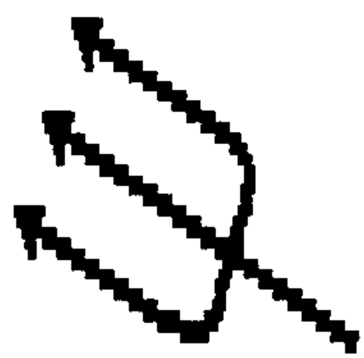
3. *Fire Resistant Pits.*

Another breach of safety brought to public attention by the Drell panel is that the W-76 and W-88 bombs do not have fire-resistant pits (FRPs). In early 1992, only ten percent of the US stockpile had FRPs. That will only grow to 20 percent upon implementation of the September 1991 and January 1992 initiatives.

FRPs are plutonium "pits" protected and contained by a ductile metal shell that can withstand a temperature of 1000^{0}C. (1832^{0}F.) and the corrosive action of molten plutonium for several hours. That is the heat expected from burning aircraft fuel. The plutonium may melt but it would be contained. Rocket fuel would be a much higher temperature. FRPs would not protect against detonation of the conventional explosive so they would only be useful in conjunction with IHE. Also, FRPs would not be able to withstand the much higher temperatures of burning rocket fuel (about 2000^{0}C) so they are more applicable to bombs and cruise missiles than missiles propelled by rockets.

4. *Enhanced Nuclear Detonation Safety.*

As IHE protects against physical hazards, enhanced nuclear detonation safety (ENDS) devices protect against electrical and electro-magnetic phenomenon. ENDS were developed in 1972 and first introduced into the US stockpile in 1977, beginning with the B-61-5 bomb. In some reports ENDS is referred to as enhanced electrical isolation (EEI). As of the beginning of 1990, ENDS had been installed on only 52 percent of the US nuclear bombs. After implementing the September 1991 and January 1992 initiatives, and after the planned retirement of other nuclear warheads, the US stockpile by the end of the century should be 100-percent ENDS equipped. Trident's Mark-5/W-88 warhead does have such a device, and so does the Mark-4/W-76. However, some weapons in the US stockpile are not so equipped so ENDS will be mentioned here.



For the chemical explosive shell to compress the nuclear pit to a supercritical state, the chemical explosive must detonate at many points simultaneously, in order to apply pressure evenly all the way around. If this does not happen, a nuclear explosion (yield) will not take place. ENDS is designed to prevent simultaneous activation of all the detonation points by stray radio or radar waves.

ENDS physically isolates and shields the warhead electrical arming device from undesired outside sources of energy or abnormal environments. Electrical entry into this isolation area is by what is described as one weak link and two strong links. They are all in series so that all must be closed in order to arm the bomb. The strong links are both closed by electrical signals initiated by different phenomena. One is closed by a coded electric signal from the operator, and the other by some normal flight environment, such as when a prescribed deceleration force is sensed during reentry.

The weak link is always closed but will fail (open) like a circuit breaker in an abnormal environment, such as fire, shock, or crushing. The firing signal must go through all three. If either of the two strong ones are not closed, or if the weak one has failed, the conventional explosive is not supposed to detonate.

ENDS will not necessarily prevent the chemical explosive from detonating, or the spread of highly-radioactive material resulting from such a detonation. But the probability of such a detonation occurring, we are assured, is one in a million.

B. WARHEADS ON THE MISSILE: LOADED TO KILL, MAIM AND POLLUTE

The danger from not having IHE and fire-resistant pits is further amplified by two aspects in the design of Trident missiles, themselves. First is the rocket motor design. Trident-1 uses a rocket fuel which is so touchy the Air Force would not use it in MX, except for the smaller third stage motor which ignites way out in space. Trident-2 uses this more volatile propellant to increase its range a mere 100-150 nautical miles.

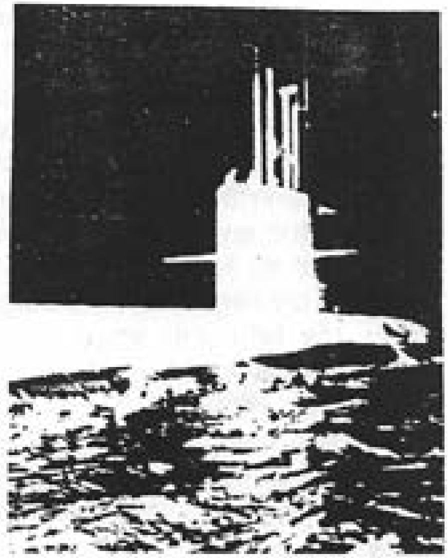
The other aspect is the manner in which the warheads are clustered around the third-stage motor. During the 1972 EXPO task force to configure an extended-range Poseidon missile -- now known as Trident-1 -- a third-stage motor was added. Warheads under the Poseidon nose fairing were arranged ten in an outer circle and four in the center, on the deck of the PBCS. To find space for this new third-stage motor, the center reentry vehicles were removed. A third stage motor was then installed protruding up through the deck on which the warheads are mounted -- right in the middle of the circle of bombs. This arrangement then carried over into Trident-2.

So now the responsible officials are belatedly worried that placing such touchy propellant in the middle of the warheads raises the ante for an accidental nuclear blast. Since the Drell Committee released its report, Trident missiles can no longer be handled with their warheads installed. The warheads are mated to the missile after the missile is installed in the submarine. Both the British and US Navies claim this was their procedure anyway.

According to the Bush-Yeltsin Agreement, only half the previously-planned number of Trident warheads will be deployed by 2003. One way of accomplishing that is to only load four on each missile, instead of eight. If that were the means chosen for reduction, Dr. Ray Kidder suggests using the space left to add blast deflectors and shielding that would protect the four remaining warheads from possible explosion of the third-stage motor. [See Kidder-1992, p. 13] If that were done, no missile could carry more than four warheads. And since Britain plans to lease missiles from a common pool, the British missiles would also be limited to four warheads each. A bad aspect of this idea is that the planned compliment of missiles will still be required and production could not be stopped.

C. THE SAFETY OF BRITAIN'S TRIDENT.

In response to public and parliamentary concern over how the Drell findings relate to the British Trident, the Secretary of State for Defence in mid-1991 commissioned MOD's Chief Scientific Adviser, Professor E.R. Oxburgh, to head up a Safety Review Group to "review, in the light of any relevant aspects of the report of the Drell Panel ... the safety of the present and prospective UK nuclear armory." [HC-337 of Session 1991-92, p. xv] The Safety Review Group's 12 February 1992 report (not published in sanitized version until the following July) pointed out that procedures for ensuring the safety of British nuclear weapons are many and complex, and that there is no single coordinating body. Although present arrangements are good for individual systems, "they are less good for viewing the safety of the *system as a whole*." (emphasis in original) [*The Safety of UK Nuclear Weapons*, p. 1]



The Safety Review Group pointed out that "in the case of Trident, the *whole system* comprises warhead, missile, submarine reactor, torpedoes, shore facilities, etc.," and added that an overview of the whole system is difficult but essential." [*The Safety of UK Nuclear Weapons*, p. 1] The Group then offered twenty detailed recommendations to provide that proper overview. [*The Safety of UK Nuclear Weapons*, pp. 4-6]

Britain's 100-kiloton warhead for Trident has been shown in previous chapters to be the equivalent of the US W-76. The MOD's Safety Review Group reported that AWE personnel are reviewing the nuclear safety of their warhead's design with new computational methods. The Group points out that substituting computer studies of this kind for actual nuclear testing has only become feasible in recent years. But US government experts don't seem so confident that such studies are yet reliable. They say computer-assisted modeling *if perfected* could *eventually* accomplish the same goal as actually nuclear test explosions in verifying safety improvements. (emphasis added) [*The Sun*, 6 August 1992, pp. A1 & A4]

In addition, the Safety Review Group points out that the accuracy of such computer modeling can only be verified when another team of experts arrives at the same results independently, and by comparing these results with data from low-yield underground tests. In the first place, there is no second group of experts in Britain to independently verify the computer-assisted results. Regarding comparison with actual nuclear tests, US Assistant Secretary of Energy Richard Claytor said at least 25 test explosions would be needed to verify the effectiveness of proposed new safety enhancements to five US weapons systems, including the W-76 warhead. [*The Sun*, 6 August 1992, p. A4] Under the September 1992 US law, no more than 15 nuclear tests are possible between the end of the 9-month moratorium and the complete ban in 1996. It is unlikely that past tests would be transferable to new safety features.

Another recommendation of the Drell Panel was to *not* attach warheads before transporting the missile to and installing it in the submarine. Rather, the missile should first be installed into the submarine and then proceed with attaching the warheads. The Safety Review Group acknowledged that attaching warheads after missiles are in the submarine is to be British policy, but expressed concerns that when whole-system considerations are taken into account, "we feel that one practice may not be significantly preferable to the other." [*The Safety of UK Nuclear Weapons*, p. 29]

Still another point of concern is in regard to the missiles, themselves, which are to be leased from the US. The Safety Review Group said: "The US have now accepted the Trident [missile] for service use but, particularly because some elements of the UK system are different, the UK authorities do not take the view that [the missiles] can therefore be assumed to be safe for UK use.... the UK must also assess safety thoroughly where there are differences from the US practices, e.g. different cranes, different jetties, different hulls, differently trained civilian and military personnel, etc." [*The Safety of UK Nuclear Weapons*, pp. 29 & 30]

The Safety Review Group's conclusion stands as a stark signal of danger -- "We conclude as we began by emphasizing that there is inevitably some degree of hazard associated with nuclear weapons." The Group's report ended with a warning that past successes in British nuclear weapons programs may be the nation's worst enemy: "The physics and engineering programmes remain enormously challenging, but they have been conducted so long without major untoward incident, that there is a danger that they may come to be regarded as straightforward and routine. Nothing could be further from the truth: the fatal Challenger accident in the US space programme is a chilling reminder of what can happen if a potentially dangerous technology is taken for granted. [*The Safety of UK Nuclear Weapons*, p. 35]

British-American Security Information Council (see Appendix-A) will soon release its report on the safety of Britain's nuclear stockpile, probably in late 1992. It is a concise and thorough documentation of Britain's nuclear weapons safety and potential problems.

The report on the safety of British nuclear weapons can hardly be classed as "generally a reassuring statement," as the Ministry of Defence described it to Parliament. [HC-337 of Session 1991-92, pp. xv-xvi] Rather, it seems to reveal a plethora of deficiencies in understanding and meeting the hazards of British nuclear weapons. A long and detailed list of recommendations was forthcoming. Techniques for determining safety were questioned and in some cases, at least by implication, decried. In many cases more detailed studies and better understanding were advised in order to perform realistic safety evaluations. Yes, the Ministry of Defence has gone through the motions of performing a safety investigation. But passing that investigation off as "generally a reassuring statement" is gross deception.

D. COMMAND AND CONTROL: LOOSE FINGERS ON THE BUTTON

Another worrisome matter for both the US and Britain is that so much destructive power is put under the control of so few men on a Trident submarine. In a 1984 letter, the late Congressman Ted Weiss said the Navy's Congressional Liaison Office admitted that a conspiracy of only four men on a Trident submarine could fire the missiles. A Trident submarine skipper with the cooperation of three other officers -- presumably the executive officer, the weapons officer, and the communications officer -- could unleash the destructive power of as much as 6,500 Hiroshimas. They would also have a selection of target sets stored in the submarines computer, which could be fed into the missiles before launch. That is scary. Given 70 days of confined environment in an atmosphere of paranoia and secrecy, it is not hard to construct scenarios where reality can be distorted.

The Drell Panel expressed satisfaction with the technical measures and serious consideration regarding control of the use of US Air Force nuclear weapons. But it points out that "the Navy's fleet ballistic missile system differs in that, whereas launch authority comes from outside the submarine, there is no requirement for external information to be provided in order physically to enable a launch. It is also important to evaluate the suitability of continuing this procedure in the future." [Drell Report, p. 34]

In response to the report's criticism, the US Navy "reluctantly agreed" to install electronic devices in Trident submarines that can only be unlocked by shore-based authorities. [*The Day*, 4 January 1995, p. A1] How much safer this will be than previous methods is not known. But it will undoubtedly serve a public-relations purpose.

Command and control of missiles on a British submarine must be similar, and hardly any more stringent. The danger is certainly no less.

E. A CRITICALITY PROBLEM

By Katherine Jane Harine, PhD, a nuclear weapons consultant who warned of this Trident-2 missile safety hazard while working for Lockheed.

The W-88 warhead, due to its high yield, has a criticality problem that was not known to the Drell panel, although it was listed as an "exception" in the final weapon development report by the designing laboratory, the Los Alamos National Laboratory. Subcriticality cannot be assured if water penetrates the warhead. There is a sufficient quantity of enriched uranium in a small volume so that when water floods the internal U^{235}-rich components, moderating the neutrons, a critical geometry is established. The result is a boiling water reactor.

A boiling water reactor is one whose criticality depends on the presence of water. As the power level of the reactor increases and the heat turns the water into steam, fewer water molecules are present in the reactor; hence, the moderation decreases and the nuclear reactions are fewer. Then, as the power level decreases, the reactor cools causing the water to condense. Thus more water molecules return to the reactor and the nuclear reactions increase again. The result is a reactor which is self-limiting. It will not explode. It will continue working.

In the case of the W-88 an explosion would be small and the reaction would cease. By continuing, the W-88's nuclear reactions will produce radiation and radioactive debris, fission fragments. The radiation will only have a local effect. However, the radioactive fission fragments will disperse throughout the environment emitting radiation wherever they go. These radioactive products are deadly when ingested or inhaled by animals or humans.

The [Mark-5] reentry body and the [W-88] warhead inside it have seals to prevent the ingress of water at moderate pressures. Initially it might appear that only the loss of a submarine in the deep waters of the ocean would produce pressures high enough to rupture the seals. However, several other scenarios of accidents which could result in the breach of the seals exist. One would start with the weakening of the seals due to heat from a fire. Another would begin with damage to the seals from a shock wave or projectiles from an explosion or dropping accident. If one of these scenarios preceded the falling of the reentry body into a shallow depth, water infusion could easily occur. The nuclear reactions would begin and continue until enough of the enriched uranium was expended so that the mass is no longer critical. Although the direct radiation from the warhead would be dangerous to animals or humans nearby, the real danger is from the fission products that would escape and propagate throughout the environment.

Iodine 131, cesium 137, and strontium 90 are typical radioactive products that will enter the body and then radiate as they decay. Iodine is absorbed by the thyroid gland, cesium is similar chemically to sodium and potassium, and strontium is similar chemically to calcium. As might be expected, strontium 90 shows up in milk and then bones after it is released throughout the environment. The fact that these radioactive isotopes enter tissues so easily and then radiate inside the tissue makes their effects so hideous.

The design criteria that forced the warhead to have this critical geometry are the range and yield that have been stipulated. If a shorter range of a lower yield were allowed, a warhead could be designed without this criticality problem. Of course, the high yield and long range are needed to attack hard targets -- i.e. super hard missile silos. Since these silos contain the SS-18 missiles, which would be the first missiles launched [if Russian struck first] due to their high number of multiple reentry vehicles, the Trident-2 with the W-88 would [by targeting these silos] be a first strike weapon. If the former Soviet Union had launched first, these silos would be empty.

There are only 400 of the W-88 warheads instead of a planned 4,000 or so because the Rocky Flats facility, which manufactured the W-88 pits, was closed down due to safety and security problems. The 400 W-88s are still a significant number, however. The 400 could be loaded on two Trident-2 submarines or spread out over all the Trident-2 submarines, which are based in the Atlantic Ocean. Since the United States does *not* need a first-strike capability, it would seem prudent to replace the 400 W-88 high yield warheads with lower yield W-76 warheads which do not have the criticality problem.

* * * * *

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5.2 TRANSPORTATION: UNSEEN DANGER LURKS

Trains and trucks (lorries) criss-cross our nation daily with cargos ranging from small missile motors through monstrous strategic rockets and space launch boosters, to the actual nuclear warheads. Yet the public is never warned. A nationwide network called The Agape Community has been tracing these rail shipments and organizing track-side vigils along their routes to alert endangered people. Another organization called Nukewatch monitors the roads for nuclear tractors and trailers in both the US and Britain. Citizens are dumfounded to discover the cavalier practices used to ship extremely dangerous materials.

If a main highway or railroad track passes through your community, there is high likelihood that this dangerous cargo also goes by. We have been lucky that previous accidents were not worse, but it is only a matter of time until we reach what statisticians call "Probability One," the moment when our chances run out and something really serious occurs. Will it take such a catastrophe before the peoples' right to know abates this hazard?

A. THE NUCLEAR TRAIN

Prior to 1972, US nuclear weapons were transported by commercial carriers under armed escort by the Atomic Energy Commission (AEC), predecessor to the Department of Energy (DOE). The AEC also shipped nuclear weapons by aircraft until 1976, until it became unlawful to ship plutonium by air. Since those dates nuclear weapons have been shipped in DOE-owned other means. The DOE does not use ships.

The DOE is only responsible for nuclear weapons shipments from the point of assembly (Pantex, Texas) to a Department of Defense (DOD) destination. After that the shipping responsibility lies with the DOD.

The nuclear train and its commercial predecessors ran unnoticed from the early 1960s until Jim Douglass discovered its purpose on 8 December 1982. The train as originally noticed was composed of 25 low-height, heavily-armored cars (known as safe-secure railroad cars) which were painted pure white to reflect heat. At each end of the string of safe-secure cars was a security car with a high turret from which a guard could look over the top of the train. Additional security vehicles traveled the road alongside the train.

Discovering the movement of this nuclear train prompted formation of a network of track vigilers all along the route. A lookout at Pantex, the train's origin, would alert the network when the train embarked, either for Sub Base Bangor on the west coast or Charleston, South Carolina to the east.

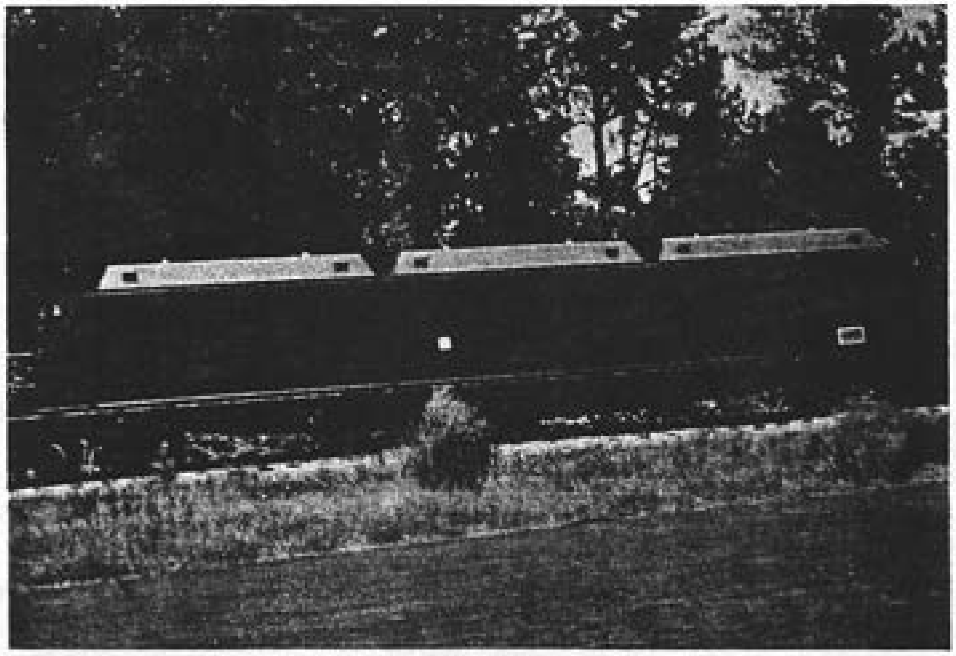


FIGURE 5.2-1
SAFE-SECURE RAILROAD CAR -- TSSX-567
Photo taken at Kings Bay on 17 May 1988
White superstructure added to accomodate Mark-5/W-88 warhead.

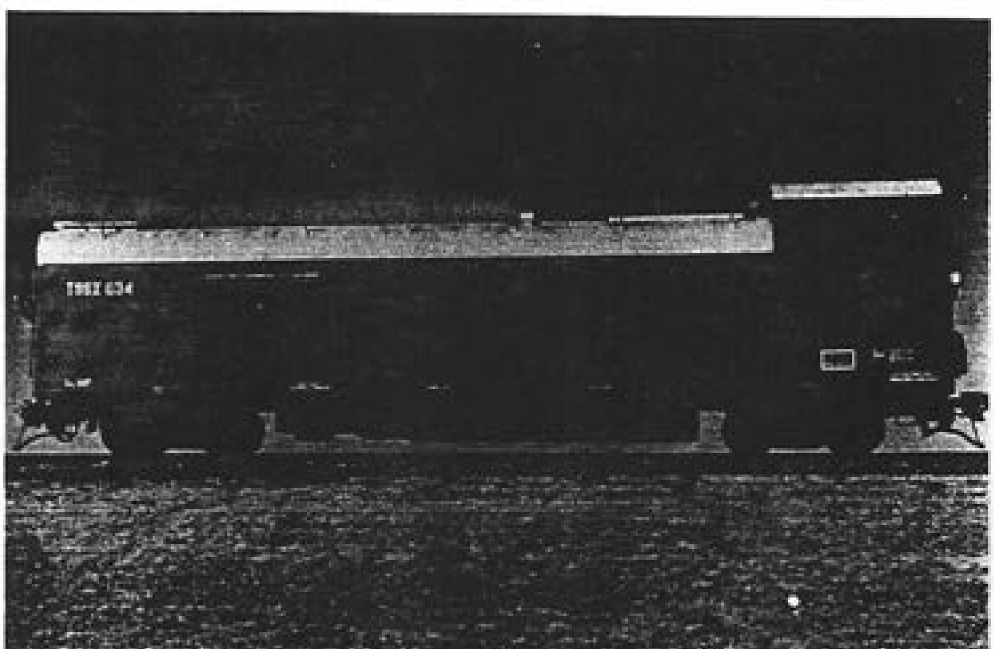


FIGURE 5.2-2
SAFE-SECURE GUARD CAR -- TSSX-G34
Photo courtesy of Agape Community.

Sometimes the train would take alternate routes in an attempt to evade the people waiting along the tracks to express concern about this load of destruction passing through their communities. But the white train stood out like a sore thumb and aerial patrols -- usually media helicopters -- could pick it up quickly. This led to repainting the train -- each car a different color. Later some of the bomb-carrying cars had an additional superstructure added to accommodate the larger Trident-2 warheads.

Nuclear train cars are designated TSSX -- TSS meaning Transportation Safeguards [at DOE] Sandia, and the X meaning the cars are not owned by the railroad, or that they are under long-term lease from the railroad. The bomb-carrying cars range from TSSX 519 to 570. The turret or guard cars are designated TSSX G32 through G35.

The Department of Energy threatened to make it a crime to publish information about movements of the nuclear train. Violations would be punishable by a $100,000 fine or 20 years in prison. Nevertheless, the Agape Community grew, and continued to vigil along the tracks as the train passed.

The nuclear train disappeared in 1986, except for a trial run of a car converted to carry Trident-2 warheads in 1988. (See Figure 5.2-1) So much attention being drawn to nuclear warhead movement must have embarrassed the US government, so shipments by train were discontinued. It is presumed that warheads are now being transported by other means. DOE transportation by air is currently only of weapons equipped with IHE. The Pentagon, with a need to ship overseas as well as in the US, has restrictions that are not so rigid. The Drell Panel recommended: "In the interest of safety against plutonium dispersal there should be a consistent policy governing the very large number of weapons movements whose numbers have typically, in recent years, added up to more than 1,000 vehicle trips and one-million miles per year." [Drell Report, p. 30]

In early February 1992, Assistant Defense Secretary Stephen J. Hadley suggested to the Senate Armed Services Committee that the nuclear train be loaned to Russia to haul its warheads in from the field for deactivation. On February 17th Russia accepted the offer of using the 25 special boxcars along with 250 special warhead containers and smaller containers for components -- even bullet-proof blankets with which to cover the warheads. However, the nuclear train still sits at Pantex, Texas and could be used again. As for now, nuclear warheads continue to be hauled by truck [see below]. Observers at Pantex are seeing a lot of nuclear truck activity movi ng in and out of the plant.

B. MISSILE-MOTOR BOXCARS

When a special freight train destined for Sub-Base Bangor derailed near Puget Sound in April 1986, Navy officials promptly disclaimed the presence of explosive material. Documents later obtained through the Freedom Of Information Act revealed that over 50 tons of Class-A explosives in the form of Trident-1 (C-4) rocket motors were on board. Class-A tops the danger list.

Conditions became acute in Alabama in November 1988 when an afternoon freight train enroute to Cape Canaveral edged east from Birmingham. It derailed a mile outside of Talladega at about 4:00 PM. Steel box car number DODX 29504 left the tracks with a pair of Trident-2 (D-5) missile motors inside. Flashing warning lights and a placard reading "EXPLOSIVES A" prompted sheriff deputies to immediately evacuate people living within a

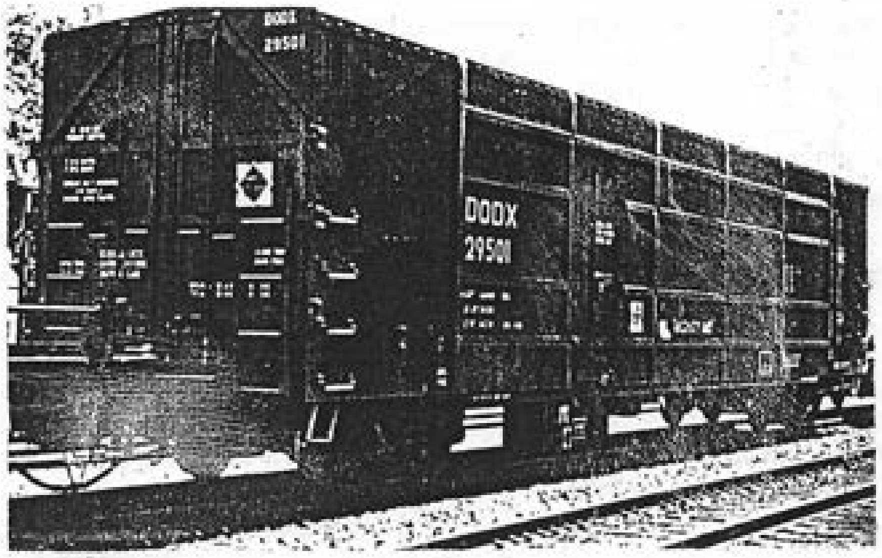


FIGURE 5.2-3
MISSILE-MOTOR BOXCAR -- DODX-29501
Photo Courtesy of Agape Community

mile radius.

These close encounters with disaster epitomize the danger that rides the rails of America. Luckily, no one was hurt in either incident. But had a fire started this story could have had a different ending. Had it caught fire in a city, the outcome would have been catastrophic.

The Department of Defense owns nine specially designed and constructed boxcars designated DODX 29500 through 29508. DOD, of course meaning that the cars belong to the Department of Defense, and the X signifies they are not owned by the railroad. These boxcars have an environmental control system (air conditioning) which maintain the temperature between -20°F and 120°F. If the environmental control system should fail and the weather outside is not in that range, the cars cannot maintain the desired temperature for twelve hours. A warning light on an upper corner goes on if such a failure occurs.

For that reason, when the train's route will encounter an outside temperature more extreme than the desired shipping range, security escort personnel go along in case the environmental control system fails. To accommodate these people, the DOD has exclusively leased four comfortably-equipped cabooses which are also designated DODX.

Trident-2 motors contain almost 56 tons of extremely high explosive propellant. It is general practice for over 50 tons of rocket propellant to be shipped in one boxcar. Two such box cars have been observed adjacent to each other in one train -- it is possible there could be more. The propellant composition is secret but it is a real bomb which can be ignited by fire or a sharp blow. The resulting explosion is so powerful that Trident-2 test launches at Cape Canaveral took place according to stringent weather criteria because under certain atmospheric conditions a motor explosion would damage the nearby

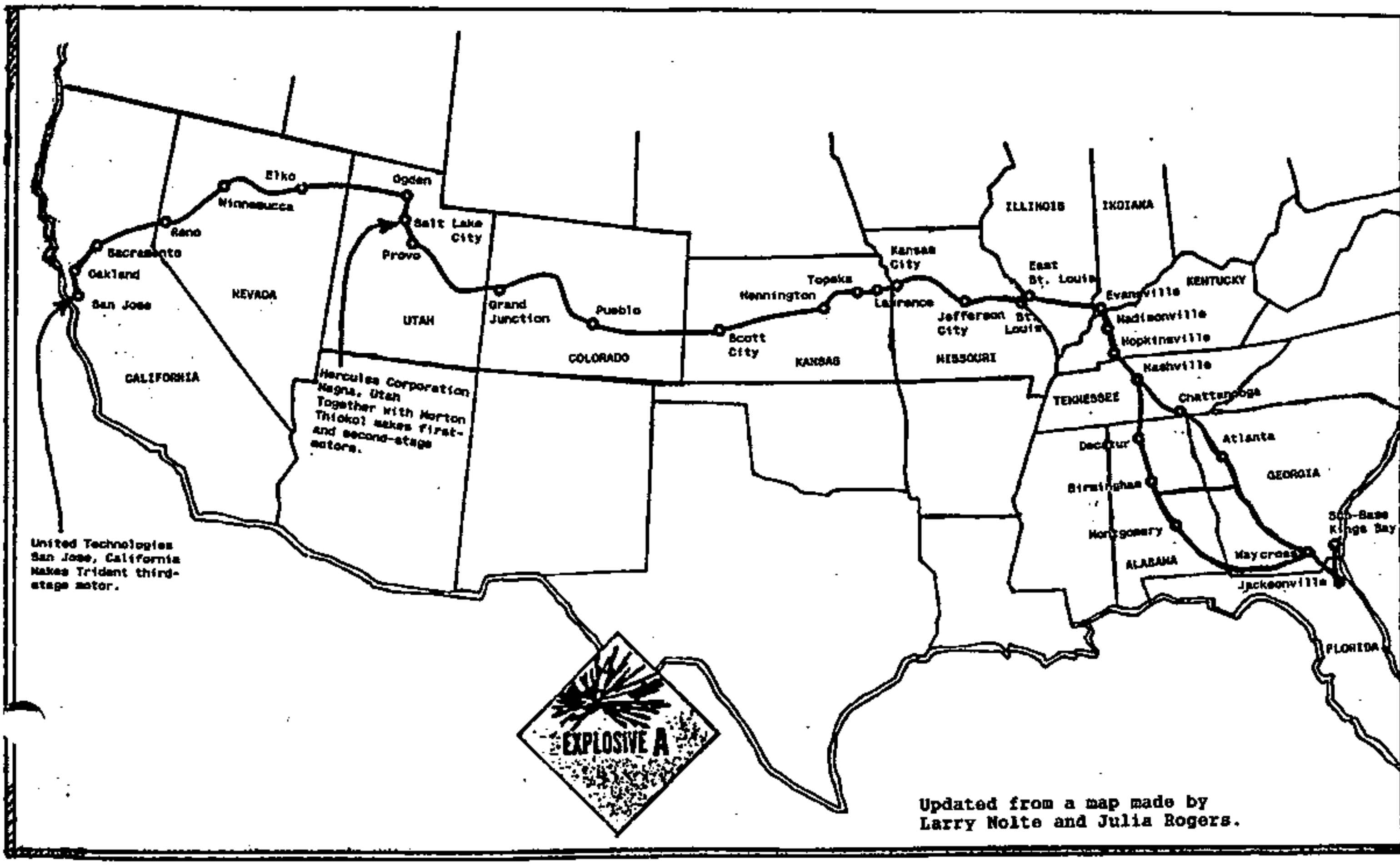


FIGURE 5.2-4
RAILROAD MAP OF MISSILE MOTOR SHIPMENTS

town.

The Navy requires wide buffer areas around all locations where Trident motors are handled and assembled. Personnel are also kept to a minimum. But no such safety considerations exists along railroad tracks and roads during transit because, according to the Navy, commercial carriers are subject only to Department of Transportation regulations. There are, however, special instructions warning that if a fire reaches the cargo compartment everyone, fire fighters and the public alike, must withdraw to at least one mile from the scene. Under such lax transportation procedures, these multi-ton bombs pass through our communities unannounced. Even the Alabama sheriffs didn't know what was in that fractious boxcar in November 1988.

Glen Milner of Seattle (see Appendix E) has for years studied government bills of lading obtained through the Freedom Of Information Act. From this data he has determined that during the first half of 1992 some 300 tons of propellant were transported by rail that during the first half of 1992 some 300 tons of propellant were transported by rail each month. The propellant in all three stages of Trident-2 motors is the so-called class 1.1 propellant which can detonate (as opposed to burn fiercely) from a sharp blow or fire. It is so dangerous that the Air Force will only allow it in the third stage of the silo-based MX missile.

It is this potential for disaster rumbling through Alabama, coupled with the near miss in 1988, which prompted the Birmingham City Council to pass a resolution opposing any further rocket motor shipments through their city. The resolution reads as follows:

WHEREAS Trident-2 (D-5) missile propellants are shipped by rail twice a week through the City of Birmingham; and

WHEREAS these heavily encased "CLASS A" explosives require an isolation area of one mile in all directions (should they catch fire) and thus endanger residents of Birmingham and its neighboring municipalities; and

WHEREAS the $2 billion spent on each Trident submarine siphons needed funds from the same neighborhoods endangered by these Trident shipments; and

WHEREAS our nation stands in a critical need of a conversion from wasteful, life-threatening weapons systems to a transforming response to the needs of our cities;

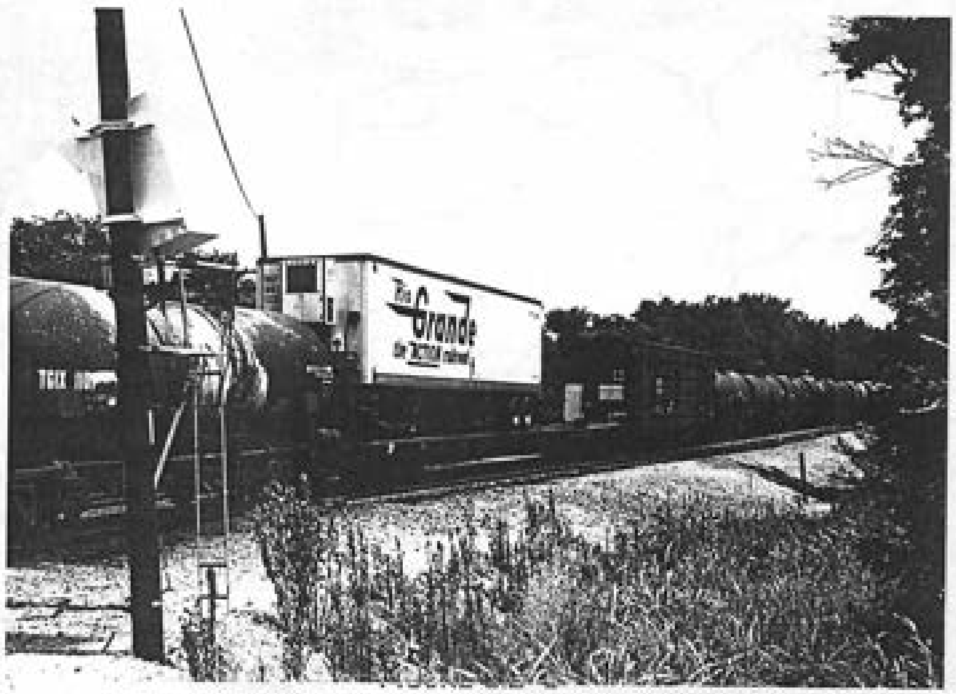
THEREFORE BE IT RESOLVED that the City council of Birmingham

1. *Opposes all further Trident shipments through Birmingham;*
2. *Requests that the President and Congress end all Trident funding and redirect the money thus saved to the needs of our neighborhoods: schools, health care, housing, job training, rehabilitation programs, and day care;*
3. *Supports Mayor Richard Arrington, Jr. in placing a similar resolution before the Black Mayors' Conference in Kansas City, Missouri opposing Trident shipments passing through and endangering any of the cities there represented and seeking the conversion of all Trident funding to human resources for our cities.*

Trident-2's third-stage motors are made at the United Technologies' Chemical Systems Division plant near San Jose, California. The completed motors are trucked from San Jose to Oakland in a special RGTZ trailer which is painted white and marked "Rio Grande The Action Railroad." Each trailer can hold four

FIGURE 5.2-5
RGTZ TRAILER WITH TRI-STATE TRACTOR
Photo courtesy of Agape Community

third-stage motors and has an air-conditioning system in front. Two warning lights are on the right-upper-front corner -- one to warn if the temperature is out of the desired range, and the other to indicate a power loss. A yellow diamond sign denotes a cargo rated "Explosives A" Tri-State tractors have been used to pull the RGTZ trailers, but it appears that Diablo Transportation may be doing the trucking between San Jose and Oakland.



RGTZ TRAILER ON A FLAT CAR
Photo by Ann Sorenson, Evansville, Indiana, 1991

At the Oakland freight yard the trailer is loaded onto a flat car for shipment to Sub-Base Kings Bay in Georgia. Sometimes this flat car may end up in the same train with DODX boxcars.

C. ARMORED NUCLEAR TRUCKS

Every day a fleet of unmarked, armored, and heavily armed articulated trucks (tractor and trailer) owned by the Department of Energy travel the nation's highways. They log over 3.5 million miles per year and are accompanied by one or more escort vehicles. Nukewatch USA has mapped the routes travelled by these trucks. It has also advertised the truck's appearance and characteristics, as well as that of escort vehicles. Periodic "Truck Watches," sponsored by Nukewatch, keeps this information current.

On 18 July 1991, Metanoia Community observed for the first time a convoy of three 18-wheeler trucks escorted by five security vehicles enter Sub Base Kings Bay in Georgia. It is presumed they were carrying thirty-six Mark-5/W-88 warheads.

The DOE tractors which transport nuclear warheads and components are made by Marmon Motor Company of Dallas, Texas, but have no special markings and carry no warning signs of explosive or radioactive cargo. The heavily-armed personnel wear no distinctive uniforms or badges. The trucks do bear government license plates beginning with "E", and usually have stripes painted on the cab. There is a horizontal radio antenna

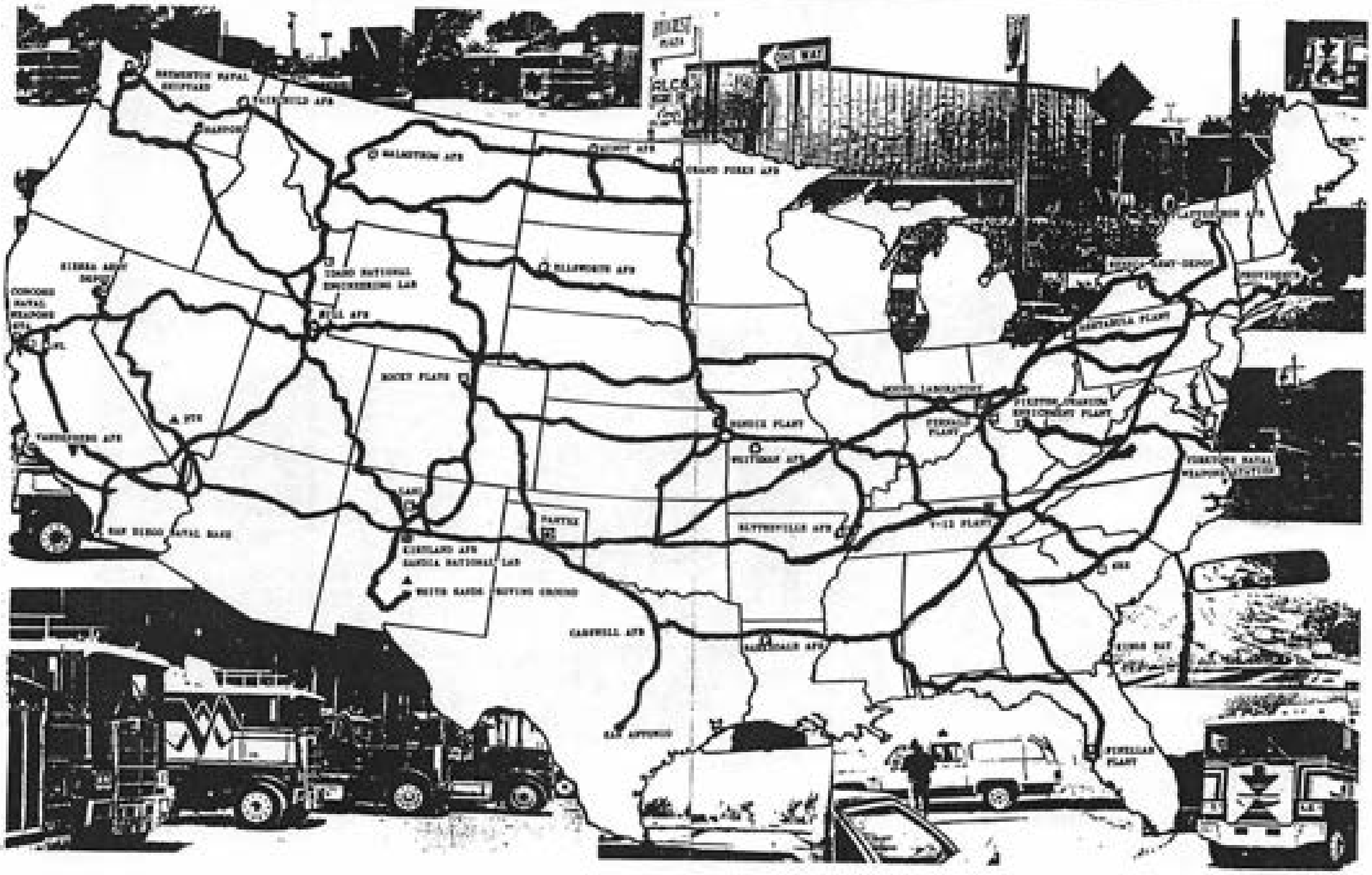


FIGURE 5.2-7
MAP OF NUCLEAR TRUCK ROUTES
Courtesy of Nukewatch USA

across the top of the cab. Newer tractors are long-snouted rather than cab-over-engine design.

The "safe-secure trailers" have unpainted steel sides. The letters "AM" are painted on the right front. A metal box protrudes below the trailer floor. Diagonal black and white stripes on the rear go about a third the way up the back of the trailer, which contains intricate alarms and security devices to prevent unauthorized entry.

Two or more courier vehicles escort the trucks. They are also plain and are usually Chevrolet Suburbans. A radio antenna is on the left rear of the vehicle and a white box is at the base of the antenna. Both truck and courier personnel are heavily armed and have shoot-to-kill authorization.

Nukewatch-USA has not tracked nuclear bomb trucks since 1992 because they lack funds and volunteers. Peace Camp at Pantex, Texas reports there is a lot of activity hauling H-bombs and materials in and out of the Pantex plant. Anyone wishing to become involved with tracking nuclear bombs and warning local people and authorities should contact Nukewatch-USA, P.O. Box 2658, Madison, Wisconsin 63701-2658; Phone 608-256-4145.

NUKEWATCH PHOTO by Carry Condon

Rear view of safe secure trailer: Diagonal black and white "pin stripes" go about one-third the way up the back of the trailer.

NUKEWATCH photo by Nat Batchelder

Courier car: One or more of these escort each convoy, traveling sometimes close by and sometimes at a distance. Usually Chevrolet suburbans or similar. They are fitted with a radio antenna at left rear of vehicle; white box near the base of the antenna.

FIGURE 5.2-8

DOE TRUCKS AND ESCORT VEHICLES

Department of Energy "safe secure trailers" have no identifying markings and no warning signs of the nuclear and explosive cargo. The convoy crews are heavily armed but wear no uniforms or insignia. Features typical of these trucks are (a)unmarked and unpainted steel trailer sides, (b) horizontal radio antenna on top of cab, (c) perhaps the "Marmon" manufacturing emblem on front and sides of cab, (d) most trucks painted with stripes as shown, (e) US government license plates starting with the letter "E", (f) the letters "AM" on right front of trailer, and (g) metal box protruding below trailer floor. Cab-over-engine tractor at upper right has been in service since the 1970s. The long-snouted tractor at bottom right --also made by Marmon Motor Company of Dallas, Texas -- has been in use since the late 1980s. Tractor photos obtained from the DOE through a Freedom-of-Information request by Glen Milner of Seattle, Washington.

D. NUCLEAR WARHEAD CONVOYS ON BRITISH ROADS

By Nigel Chamberlain (Nukewatch-UK)

Most nuclear warheads are transported in Britain by road although the Ministry of Defence has investigated the possibility of a return to sea transportation. Trident warheads are moved from AWE Burghfield near Reading in the south of England to RNAD Coulport on the Clyde near Glasgow in Scotland. The warheads are stored in underground bunkers until required for the operational patrols of *Vanguard, Victorious, Vigilant* and *Vengeance* from their Faslane submarine base.

Chevaline warheads from the decomissioned Polaris submarines are returned by road to AWE Burghfield from RNAD Coulport for dismantling. Britain's other nuclear bombs, the WE-177, are being removed from Royal Navy surface ships and Royal Air Force Tornado bombers. It is believed that the fissile material from these warheads is refurbished for Trident warheads.

Unmarked warhead convoys frequently use the very busy British roads and drive past, or through, major conabations (Oxford, London, Peterborough, Leeds, Newcastle, Carlisle, Edinburgh, Glasgow) without informing the Local Authorities. Nukewatch-UK is a network of local activists which monitors the movements of these convoys and campaigns against secrecy and for public safety.

FIGURE 5.2-9
FODEN TRACTOR WITH TRUCK CARGO HEAVY DUTY MARK-II NUCLEAR WARHEAD CARRIER
Photo courtesy of Nukewatch-UK and CND

The aging Mammoth Major carriers were replaced by "Truck Cargo Heavy Duty Mark-II" carriers in 1992, which are manufactured by Brown and Root Vickers. The carriers are built over three axles and are articulated. They are dark green and covered with a green tarpaulin. The tractor units are made by Foden and have a distinctive vertical exhaust pipe and an air conditioning system on the cab with a spiked cooling unit on the driver's side. There are military number plates on the front of the tractor unit and on the back of the carrier. Apart from two "long vehicle" signs, there are no other warning signs on the carriers.

FIGURE 5.2-10
CHRIS AND NIGEL CHAMBERLAIN WITH ONE OF THEIR SONS MARKING A NUCLEAR CONVOY ROUTE
Photo courtesy of Nukewatch-UK and CND

As many as five warhead carriers are escorted in convoy by three RAF and MOD motorcycle outriders, two light green transits with officers and technicians, four or five grey transit vehicles with armed Royal Marines, a spare tractor unit for breakdowns, a fire engine, a tow truck, and a convoy support vehicle which carries radiation detection and decontamination equipment and is fitted with sophisticated communications.

There have been a disturbingly large number of "incidents" involving nuclear warhead convoys through the 1980s and 1990s, ranging from frequent breakdowns, occasional accidents, and one civilian fatality. Most serious of these were the overturning of one carrier on icy roads in Wiltshire on 10 January 1987, a crash which killed a motorists in Somerset on 17 September 1988, and a crash in Northumberland on 11 August 1993 when

FIGURE 5.2-11
RAF TRANSIT VAN
Photo courtesy of Faslane Peace Camp

a large civilian lorry went out of control and seriously injured an RAF motorcyclist at the head of the convoy.

On 1 December 1991, the very busy M25 motorway around London was closed for several hours while a warhead was removed from one vehicle by crane and transferred to another carrier. Typically, the military attempt to deal with these potentially hazardous "incidents" with their own resources and keep local authority emergency services in the dark.

Nukewatchers inform the local authorities of the movements of nuclear warhead convoys and work closely with journalists to inform an unassuming public. We lobby local and national politicians and prepare briefings for interested organisations and political parties. Some Nukewatchers are also involved with direct action against the convoys which impedes their progress, draws attention to the secrecy which surrounds them, and builds opposition to the development of the nuclear state.

* * * * *

FIGURE 5.2-12

OTHER BRITISH CONVOY VEHICLES

Left to right above: Support Vehicle, Fire Engine. Left to right below: Tow Truck, RAF Police Motorcycle, Unidentified Convoy Vehicle. Photos courtesy of Faslane Peace Camp.

Nukewatch Regional Contacts:

Scotland

Jane Tallents 0436-79194
Scottish CND 041-423 1222
Faslane Peace Camp 0436-820901

England (North)

Jimmy Barnes 091-272 2046
John Brierley 0274-730795
Nigel Chamberlain 0768-898641

England (South)

Di MacDonald 0703-554434
Evelyn Parker 0635-253231
Jean Kaye 0865-771046

England (East)

Peter Lanyon 0394-386273
Barbara Sunderland 0462-814186

Send details of convoy movements to Andy Pritchard, West Midlands CND, 54 Allison Street, Birmingham B5 5TH, telephone 021-643 4617.

FIGURE 5.2-13

BRITISH ROADS THE CONVOYS TRAVEL

The convoys travel all types of roads in all weather conditions. They frequently vary their routes. This map shows the main roads but many other roads throughout Britain are used.

Courtesy of Nukewatch-UK and CND

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5.3 ENVIRONMENTAL DESTRUCTION: A MILITARY LEGACY

An inevitable legacy of military installations is toxic waste strewn in their wake. Trident bases and related installations are no exception. The following examples speak for themselves.

A. US DEPARTMENT OF DEFENSE BASES AND CONTRACTORS

As military bases are being closed in the wake of the Cold War, the hazardous residue left behind has come to public attention. Virtually every base scheduled for closure has a hazardous waste problem, and we can be certain that those which remain in use are no less contaminated. To cover the entire spectrum of military nuclear waste would be a huge task. This section will only touch briefly on facilities associated in some way with Trident. For those who wish to delve into the matter further, the bibliography should be of some help. Further information in this area will be appreciated.

1. Sub-Base Bangor.

Sub-Base Bangor has 21 sites which made the federal Superfund list of America's worst hazardous waste sites. One 12-acre site is expected to cost $3-million and take ten years to clean up. It had been used to detonate old explosives which leave cancer-causing residues. These residues seep into the soil and eventually get into the water table which is only 60 feet below the surface. The plan is to pump ground water to the surface and zap it with ultra violet rays and oxygen to neutralize the residue. The soil will also be washed and the pollutants removed will be zapped in the same way. This operation is scheduled to start in April 1993 or thereafter.

Another site is at the south end of the base where toxic fumes from a buried drum of waste paint stripper was *unexpectedly* found in December 1991. Then containers of diesel fuel and tar were found. Ground-penetrating radar will be used to search for more waste.

2. United Technologies Corporation.

United Technologies Corporation (UTC) in Santa Clara County, California, operates a plant to manufacture, test, and dispose of solid rocket motors. Known as the "invisible empire," this plant nestles out of public view in the Las Animas hills southeast of San Jose, and upstream from Anderson Reservoir, one of the primary water supplies for the Santa Clara Valley. It is here that the third-stage motors for Trident-2 missiles are being manufactured, as were the third-stage motors for Trident-1. The UTC Conversion

Project contends that UTC pollutes the air over high-density areas, contaminates the valley's water supply, and trucks extremely hazardous explosives through highly populated communities without prior notification to safety officials. [UTC Fact Sheet]

In addition, UTC plans to build a road through a serpentine grassland plant community which includes rare and endangered plants and animals, including the Bay Checkerspot Butterfly, the Metcalf Canyon Jewel, the Santa Clara Dudlyea, and the Fragrant Fritallaria. The road cannot be started until an Environmental Impact Statement (EIS) is completed. UTC has now halted work on the EIS, presumably waiting for the Endangered Species Act to be weakened by the White House. Bay Area Mountain Watch has helped in outreach regarding endangered species.

The Youth Science Institute reported to the Morgan Hill City Council that there are an unusual number of deformed animals around the UTC facility. (Rocket testing and burning scrap fuel produces toxic byproducts, including dioxin.) [UTC Fact Sheet]

In its 28 August 1991 letter to the Santa Clara County Planning Commission, the UTC Conversion Project charged that UTC had over the past twenty years erected 82 buildings for rocket motor and propellant manufacture in violation of a county regulation that an architectural site review be conducted for manufacturing buildings. Without the public hearing required under the county regulation, UTC's use permit is valid only for research and development. Section 5 of UTC's use permit requires adequate transportation routes for hazardous materials. Loaded rocket motors have been tracked through populated areas of San Jose. Transportation hazards were discussed in a previous chapter.

On 3 February 1992 the US Environmental Protection Agency levied an eight-point hazardous-waste-violation complaint against UTC and assessed a $588,000 penalty. Three days later, on 6 February 1992, the Santa Clara County Planning Commission voted to hold a hearing on whether to revoke UTC's use permit.

The UTC Conversion Project contends that (1) UTC uses six pits to burn rocket fuel which releases tons of toxic material annually into the atmosphere, and (2) toxic chemicals are leaking from the burn pits into near underground water supplies and are less than half a mile from Anderson Reservoir. The Bay Area Air Quality Management District has ordered UTC to cease open burning by 1 January 1995. The Santa Clara Valley Water District, working with the Regional Water Quality Control Board has been working with UTC to contain the underground seepage from the burn pits. Had it not been for citizen action, these practices would have gone unnoticed.

The County Planning Commission hearing was held on 7 May 1992. They voted 4:3 to hold off on a judgment until they heard from other government agencies such as the Environmental Protection Agency. The UTC Conversion Project plans to take the issue up directly with the County Board of Supervisors. At the time of this writing the outcome has not been decided. John Beall of the UTC Conversion Project believes that, in addition to a fine, UTC will be forced to spend a given amount of money to remove toxic rocket fuel residue from huge amounts of stored solvents that were used in conjunction with the burn pit, so those solvents can be recycled.

B. US DEPARTMENT OF ENERGY SITES

On 16 December 1991 US Energy Secretary James Watkins announced that nuclear arms production sites will be cut from 15 to 5 by 1996 -- four production plants in the south and mid-west, and the Nevada Test Site. That means an enterprise which once manufactured up to 6,000 nuclear warheads annually will be chiefly responsible for maintenance of the ones now deployed and cleaning up the pollution it produced. The total employment would remain at about 57,000 workers but their effort will be changed. The ratio used to be that for every two people working on weapons production, one would be working on environmental cleanup. That ratio will now shift toward environmental clean up. Because of that some DOE facilities are claiming they perform more civilian work than military whereas they are really just mopping up their own mess.

1. Y-12 Nuclear Weapons Components Plant.

On 17 May 1963, under state and public pressure, the DOE admitted it had lost some 2.4 million pounds of mercury from the Y-12 plant. During its ten years of lithium separation (1953-1963) large amounts of mercury were required for the process. Between 220,000-470,000 pounds went into East Fork Poplar Creek. Contaminated soil from this creek was used to construct Oak Ridge city civic center and two junior high schools -- one of which was found to contain up to 300 times the normal level.

The Y-12 plant in Tennessee spreads over 811 acres with an additional 4,800 acres fenced off as a security buffer zone. Employment in 1989 was 6,500. Today it is the source for finely-machined H-bomb parts made from depleted uranium (U_{238} after all the weapons-grade U_{235} has been removed by isotope separation), lithium, beryllium, carbon foam, and other materials. A legacy of past and present activity rests in the Bear Creek Valley Waste Disposal Site west of Y-12, and is a known source of water and soil contamination. Nitrate is the main contaminate but carcinogenic polychlorinated biphenyl (PCBs), toxic chemicals, heavy metals, and radioactive substances have also been identified. This disposal site is made up of three areas: the S-3 Ponds, the Oil Landfarm Site, and The Burial grounds.

a. The S-3 Ponds.

Four unlined seepage pits were used to dispose of over 2.7 million gallons of liquid waste between 1951 and 1984. This waste included concentrated acids, caustic solutions, and by-products from uranium recovery. What wasn't evaporated or absorbed by the soil leached directly into ground water, bear Creek, and East Fork Poplar Creek.

b. The Oil Landfarm Site.

More than a million gallons of liquid oily wastes were plowed into thirteen acres between 1973-1982. These included PCBs, beryllium compounds, depleted uranium, and tetrachlorethane.

Another area was contaminated with acids, coolants, oils, metals, and debris between 1943-1970. In addition, 100,000 tons of undocumented waste was burned or buried between 1943-1968. And between 1975-1981 a 3.5-acre hazardous chemical area received solid, liquid and gaseous materials which were intentionally leaked into the soil or evaporated.

c. The Burial Grounds.

This site is divided into four sections designated "A," "B," "C," and "D." Eighteen-acre Burial Ground "A" began in 1955 to receive construction debris and secret contaminated scrap metal in unlined trenches. Over 4.8 million gallons of radioactive mop waters were dumped down standpipes into the ground. PCB-contaminated oils, coolants, and solids were also dumped, as were solvents and radioactive asbestos waste. Burial Ground "A" was covered with a waterproof cap in 1989.

Into 7.3-acre Burial Ground "C" was dumped beryllium, thorium, and uranium-contaminated materials between 1962 -1984. Closure procedures started in 1991.

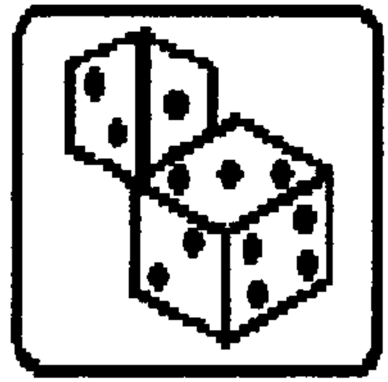
Burial Grounds "B" and "D" received depleted uranium metals and oxides during the 1960s. Burial Ground "B" was closed in 1982. Burial ground "D" remains in use, especially for radioactive uranium byproducts in unlined trenches and pits.

2. Rocky Flats Nuclear Weapons Complex.

Rocky Flats in Golden, Colorado is one of four plutonium processing sites run by the DOE. The other three are the Savannah River Site in South Carolina, the Hanford Site in Washington, and Las Alamos National Laboratory (LANL) in New Mexico. All are now shut down for plutonium processing except LANL. The DOE no longer produces plutonium for use in nuclear weapons -- it now recycles plutonium from retired nuclear weapons and reclaims plutonium that remains as scrap or residue from recycling and former processing.

Rocky Flats was closed down in November 1989 for environmental, safety and health (ES&H) issues. It is not expected to reopen as a plutonium processing plant. In February 1992 the Secretary of Energy announced that Rocky Flats will undergo a transition from weapons components production to site cleanup.

As of 7 May 1992 there were 2,805 ES&H issues identified at Rocky Flats. Three buildings (371, 559 & 707) will be put back into operation to accomplish the clean up. These buildings account for 666 of the ES&H issues. After they are cleaned up and opened, work will continue to



decontaminate and decommission the remaining buildings and grounds.

An internal DOE memo labeled "Ticking Time Bombs" disclosed that substantial amounts of plutonium were stored at Rocky Flats in unstable conditions or in potentially unsafe containers as recently as 24 September 1992 -- almost three years after the plant was closed. But the memo's author and other DOE scientists on September 25th placated adverse publicity by saying the situation presents "no immediate hazard" and that "higher-priority items are being addressed at this time." [*SJMN*, 6 October 1992, p. 6C] This raises the question of how bad Rocky Flats really is if there are more serious conditions than unsafe plutonium storage.

3. Savannah River Site.

The Savannah River Site (SRS) in Aiken, South Carolina is one of the two US facilities for producing plutonium and tritium for hydrogen bombs. It has three of the nation's four weapons-producing reactors (K, L and P). The fourth reactor -- the N-reactor -- is at Hanford in Washington. All three of the SRS reactors were shut down in 1988 because of safety considerations.

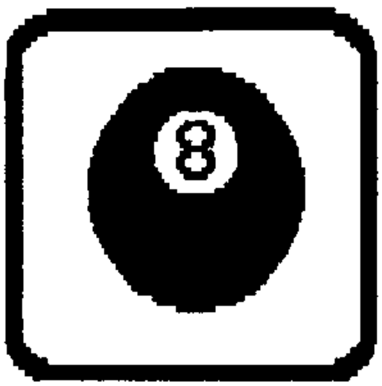
Plutonium production has now been cancelled by the DOE because enough can be recycled or reclaimed to meet military quotas. Tritium is another matter because its half-life is about 12.5 years or -- it decays at the rate of 5.5 percent per year. So the K-reactor started up again in June 1992 for a three-month trial period before reaching its goal of 50 percent power. The L-reactor is kept on standby with a one-year lead time for startup. Plans are to mothball the P-reactor. The joint DOD/DOE announcement that the reactor project had been scrapped was with reference to a new reactor, not the aging K-reactor.

A review by the Defense Nuclear Facilities Safety Board could hamper the continued operation of the K-reactor. SRS officials can't show that the plant meets standards to insure that no radiation is released into the air. The Board's report said that lack of documentation before 1989 casts doubts on the reliability of parts and equipment in the tritium-producing facility.

4. The Hanford Site.

Hanford is the other former nuclear-weapons-producing site and the home of the N-Reactor. It is the most contaminated of all DOE facilities. The place is a mess with radioactive contamination leaking into the Columbia River and elsewhere. There are problems with inadequate storage of hazardous and radioactive materials. Worker health and safety procedures have serious flaws and many injuries go unreported. A citizens group called COHO (West 2122 Dean, Spokane, WA 99201; 509/325-3475) has been monitoring the plant activities and informing the public.

Hanford is also the graveyard for submarine nuclear reactor compartments. Through June of 1991 the US Navy had commissioned 165 nuclear-powered submarines. Now the Navy has embarked on a program to inactivate about 100 of those submarines and dispose of about 85 of them by the year 2000, at an estimated cost of $2.7 billion. [See GAO/NSIAD-92-134] There are six nuclear-capable shipyards in the US but, because of its proximity to Hanford, only Puget Sound Naval Shipyard removes reactor compartments. Any submarine not inactivated at Puget Sound is towed there for reactor compartment removal.



Since 1969 there have been 42 inactivations started, 31 of those since 1986, of which six were started in fiscal year 1991. Reactor compartments have been removed from 20 of those 42. So it is easy to see that a lot more radioactive and bulky waste will be arriving at Hanford during the 1990s. Significant amounts of PCBs have also been found during submarine inactivation. Regulatory agencies are now reviewing a strategy developed by the Navy to *better* meet environmental regulatory requirements for disposal of reactor compartments.

C. BRITAIN'S NUCLEAR LEGACY

By William Peden (CND-Britain)

The British Trident nuclear weapons system relies on a large industrial infrastructure both in the UK and the US in order to survive. This infrastructure has been in place since the conception of Britain's bomb. Many plants no longer produce materials for British nuclear weapons but the legacy from over 50 years of bomb production lingers on.

This infrastructure continually pollutes the environment with large quantities of toxic and radioactive waste. The main site involved in putting together the over 2,000 components that go into a Trident warhead is Atomic Weapons Establishment, Aldermaston.

1. Atomic Weapons Establishment, Aldermaston.

This is where all British nuclear weapons are designed. The site also manufactures the key plutonium and uranium components for nuclear warheads. Due to contractorisation this site will become the only warhead component manufacturing plant in the UK by the end of 1997. Manufacturing facilities at Cardiff and Burghfield are to close, with Burghfield only retaining the role of assembling and disassembling British nuclear weapons.

a. **Nuclear Waste.** AWE Aldermaston produces large quantities of toxic and radioactive waste. They discharge radioactive material into the atmosphere through 69 chimneys and beryllium out of another nine. Aldermaston produces an average of 551 tons of low and intermediate level nuclear waste each year. They have stored on-site in an untreated state some 2,382 tons of nuclear waste. It is projected that by the year 2000 this will have increased to almost 104,000 tons and by 2030 this amount will have increased to 130,000 tons. Enough to fill roughly 423,000 London double decker buses.

By the year 2000 AWE will have run out of storage space, much of the waste is already being stored in sub-standard conditions. All AWE plans to do at present is build more warehouses to store the increasing amounts of waste.

Alongside all the operational waste stored on-site, AWE discharges into the nearby River Thames between two and three million gallons of liquid radioactive waste each year. Over the last 30 years they have discharged approximately 160 million gallons of liquid radioactive waste into the river.

They also dispose of low level waste at the national disposal site at Drigg and discharge approximately 266 million gallons of radioactive and toxic waste into the local sewerage system.

Even more worrying is the state of storage for the vast quantities of plutonium in oxide and metal forms stored on-site. All plutonium is stored in safes which are known to be inadequate for the task. The safes are in buildings with no way of stopping any leakage from escaping to the environment. Many workers have been contaminated as a result of poor plutonium storage.

b. Contaminated Site. AWE Aldermaston is heavily contaminated with plutonium and uranium as well as a number of toxic substances such as toloulene. Exact details of internal contamination are unknown as no reports are ever released. However, there is evidence that points to on-site contamination being extensive.

In 1977 a study was done of rabbits who live on-site, their skeletal systems were found to be radioactive. There have also been reports of radioactive waste dumps scattered over the site, left in the open for years unattended.

AWE's own monitoring reports have found elevated levels of radioactivity around the base perimeter thought to result from soil disturbance as a result of heavy construction on-site.

And more recently land adjacent to Aldermaston was extensively contaminated by plutonium as a result of heavy rainfall which resulted in contaminated soil being washed off-site.

c. Aldermaston's Accident Record. A detailed investigation by Greenpeace uncovered a previously unknown list of accidents on-site. These include:

- 22 fires involving radioactive material in the area where nuclear weapons design and manufacture occurs;
- 5 serious explosions that caused fatalities and wrecked buildings and equipment;

-- 2 accidents involving lithium;
-- 4 fires involving beryllium;
-- 2 accidents involving tritium;
-- 9 electrical fires in areas that could have resulted in explosions;
-- A serious leak of radioactive waste in the pipeline to the Thames; and
-- A tritium gas leak into the environment.

As a result of the Greenpeace report and extensive public pressure the Health and Safety Executive (HSE) conducted an investigation into health and safety at all Britain's Atomic Weapons Establishments. Their report was highly critical.

HSE found "a number of significant inadequacies in health and safety management arrangements." And that "taken as a whole, standards did not come up to those found elsewhere in high hazard industries, including the nuclear industry." HSE made a total of 65 recommendations on ways to improve health and safety at all Atomic Weapons Establishments. Many of these are being carried out at the moment.

Over the coming years AWE Aldermaston will have to decommission many old buildings and heavily contaminated plant and equipment. This will produce more nuclear waste that has no where to go. This problem will continue as long as Britain continues to produce Trident warheads.

This is just a brief overview of the massive environmental legacy left as a result of Britain's nuclear weapons programme. There are many other sites and many more problems. For more information read *Nuclear Wastelands: A Global Guide To Nuclear Weapons Production And Its Health And Environmental Hazards.*

NUCLEAR SUBMARINE GRAVEYARD

(This section is excerpted from a CND Defence Briefing entitled "Polaris Is Retired, Trident Takes Over. What Is The Cost?", written by William Peden.)

On 13 May [1996] Britain's last Polaris submarine, *HMS Repulse*, joined the ten other nuclear-powered submarines that have been decommissioned in the last few years. *HMS Revenge* was the first to be retired in 1992 followed by *Resolution* in 1994 and *Renown* in 1995. The retirement of the last ageing and decrepit Polaris submarine raises another question -- **What do you do with an old Polaris submarine?**

The Polaris missile rocket motors are fueled by a solid propellant of powdered aluminum bound with ammonium perchlorate. These are taken to Shoeburyness where they are disposed of by setting them on fire using explosive charges. The Navy also has to dispose of PCB based lubricant and heat exchange oils from capacitors and transformers; CFCs within the air conditioning and refrigeration plants; and huge amounts of lead-acid batteries full of heavy metals, among other things.

But in addition to the toxic materials on-board there is the huge radioactive inventory that has to be dealt with. The [submarine propulsion] fuel rods are taken to Sellafield where they sit awaiting an as yet undetermined fate in cooling ponds. Nobody knows how to reprocess submarine spent nuclear fuel. There are about forty fuel cores at Sellafield waiting to be dealt with, each containing between 200 and 250 kilograms of highly enriched uranium.

There is also toxic and radioactive sludge accumulating at the two refit yards -- Rosyth and Devonport. This waste material not only arises from decommissioning but also from the day-to-day refit operations carried out on nuclear-powered submarines. To clean out the reactor pipes, resin beads are flushed through the reactor. The resultant waste beads are not only radioactive but are also toxic. There is currently no solution as to how to dispose of them because of their heavy toxic content. The beads eventually form a very nasty porridge-like substance. This is stored in Resin Catch Tanks or old nuclear fuel flasks. There are at present over 23 containers full of this stuff at Devonport and 20 at Rosyth. If no solution is found to this problem Devonport management estimates that 180 containers of this waste will have accumulated there by 2010.

The Chevaline nuclear warheads will be returned to the Atomic Weapons Establishment at Burghfield where they will be dismantled and those parts that can be reused or recycled will eventually find their way into Trident warheads.

The biggest question is what to do with the hulk of the submarine, containing around 850 tons of radioactive material in its reactor compartment -- 30 feet in diameter and 24 feet in length. The Royal Navy has decided to store the submarines afloat until 2012, when they hope the deep disposal NIREX facility will be available. At present at Rosyth there are seven submarines:

HMS Dreadnought
HMS Swiftsure
HMS Churchill
HMS Revenge
HMS Resolution
HMS Renown
HMS Repulse

At Devonport there are a further four:

HMS Conqueror
HMS Courageous
HMS Warspite
HMS Valiant

The policy to store afloat will cost an estimated 225 million pounds.

Despite the vast quantities of radioactive and toxic waste produced and left for future generations to dispose of, the MOD has decided to continue deploying nuclear-powered submarines. The Royal Navy has at present 27 nuclear-powered submarines, including the four Trident boats. Eleven of these have already been decommissioned with a further two or three to follow by the turn of the century.

Is it wise to continue building nuclear-powered submarines when you don't know how to get rid of them at the end of their life and you don't know how to get rid of the vast majority of radioactive and toxic waste produced throughout a nuclear submarine's operational lifetime?

* * * * *

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SECTION 6
TRIDENT
ECONOMICS

6

6.1 MILITARY CONTRACTING: WEAPONS PROCUREMENT AND BUDGETS

When all other justifications for military programs are exhausted, two standby arguments come into play. First is the too-much-invested-to-stop-now reasoning. Should that fail, the last ditch stand is to portend huge layoffs and a ruined economy -- implying that military contracts are necessary to provide jobs. These two overused arguments have prolonged many defunct and unneeded military programs. This chapter will address the too-much-invested-to-stop-now excuse. Jobs and the efficiency of military contracting in generating jobs will be discussed in the next chapter.

The corporate world does not continue programs merely because they have absorbed a large investment. When a program is unprofitable it is cut off immediately and what money can be recouped is re-invested into something more worth while. That is the only way that a business can compete.

But military contracting is the flip side of the coin. It is more profitable for the contractor to continue even if the product doesn't work, because the government is footing the bill and the corporation is getting a cut. Therefore, all the excuses available are conjured up to prolong the weapons contract. The too-much-invested-to-stop-now reasoning has also been overworked in the case of Britain's Trident submarine.

The construction of Britain's fourth submarine was a very controversial issue during the 1992 elections. Royal Navy officials said that 140-million pounds, out of the total 550-million pounds projected cost for the fourth ship, have already been spent on long-leadtime items. To diminish the savings by comparison, the British Navy says it would be saving only about 400-million pounds out of its official figure of 10.518-billion for the entire Trident fleet. (VSEL Chief Executive Noel Davies contended that a lower figure of no more than 250-million pounds saved, but of course his figures are slanted toward the best deal for Vickers.) Greenpeace UK has pointed out that the government's figure overlooks the 408-million-pound running cost and the 474-million pounds needed for three refits over the submarine's lifetime. Neither does it include some 19-million pounds for decommissioning the vessel after it is worn out. Greenpeace UK calculates that 1.301 billion pounds in 1991-1992 prices would be saved over the next 30 years if the fourth submarine were cancelled in 1992. [*The Rising Cost of Trident*, pp. 9 & 10]

That is just the savings from stopping the fourth boat. If the entire British Trident program were immediately scrapped, the savings would jump to 16.99-billion pounds at 1991-1992 prices. [*The Rising Cost of Trident*, pp. 10 & 11]

A. HOW WEAPONS PROGRAMS EVOLVE

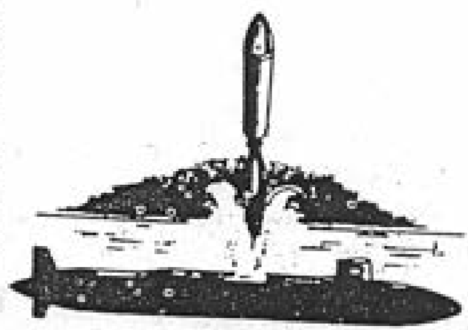
It is useful in resistance work to understand where, how, and why military projects originate.. The following is an analysis of both the US and British procurement processes.

1. The American Procurement Process.

Most ideas for new weapons systems in the US originate in the "Futures" or "New Horizons" departments of weapons contractors. A few come from research grants to foundations of learning but the majority are unsolicited proposals to gain a new weapons contract or to prolong an existing one.

A classic example of keeping the business going is the submarine-launched ballistic missile (SLBM) program which began with Polaris in the 1950s. Lockheed cornered the contract and the 1,200-nautical-mile-range Polaris A-1 became operational in 1960. Lockheed in the meantime submitted a proposal to make the first stage motor 30 inches longer to accommodate more propellant which stretched the range to 1,500 nautical miles (nm). That became operational two years later (1962) as the Polaris A-2. Lockheed then proposed another version which gained 16 inches in motor length by using three shorter warheads under a nose fairing -- all the warheads went to the same target. Weight was saved by using filament-wound fiberglass motor cases. This Polaris A-3 could reach out for 2,500 nm and became operational in 1964.

Lockheed then proposed the Polaris A-4 which became larger in diameter by removing the thick stowage/launch adapters used to shim between the missile and the launch tube. Technology under study for a number of years allowed putting many small warheads on the missile and directing them to separate targets. But there was a new administration at that time, and President Johnson preferred to name missiles after Greek gods, rather than Lockheed's custom of namesaking stars. Polaris A-4 became Poseidon C-3. The range was the same for a full load of 14 bombs, but could stretch to about 3,000 nm with only ten bombs. Also, it could attack 10-14 targets instead of one. The C-3 became operational in 1971.



During the mid-1960s a Pentagon-commissioned study defined the future Underwater Long-range Missile System (ULMS) which became the Trident-2 (D-5). However, since it was so huge, and would only fit into a new and bigger submarine, it would take a decade or longer to become operational. Lockheed would be left without a missile contract for years. So a task force was set up to define an extended-range Poseidon -- the Poseidon C-4 -- which could be manufactured quickly with existing or near-term state-of-the-art.

Lockheed once attempted to make the Poseidon C-3 reach 3,600 nm by reducing the payload to six bombs. But that never worked out because the trajectory was so shallow, and the reentry time so long, that heat caused about half the warheads to disintegrated before they reached their targets. To stretch range it was necessary to make a higher and steeper trajectory. That meant more rocket fuel, so a third-stage motor was installed under the nose fairing in the middle of the ring of warheads. Other means of weight saving and streamlining were also used but the additional motor was essential. Finally a concept was defined.

But the Navy shelved the proposal until the new Trident submarine program was under way. Congress would certainly have delayed that program if it were known that a longer-range missile could be acquired much cheaper and over a shorter time. After the first Trident submarine was authorized in early 1973 (for the FY 1974 budget) the C-4 was introduced as an interim fix. But its name was changed to Trident to make the program more consistent. Thus the C-4 was called Trident-1, and the D-5 became Trident-2. Lockheed cornered both contracts.

So by continually defining ways to increase missile performance, Lockheed has reaped massive profits from SLBM programs over more than three decades. Now let us return to the US procurement process.

When Pentagon officials receive a proposal and decide it is something they would like, the first step is the concept definition stage. After a budget has been approved for that purpose, two or more companies may be invited to compete in performing trade-off studies to reach an optimum configuration. Sometimes for big projects, different companies form a team and divide the contract. In that case, two or more teams may be invited to participate. The company or team with the best concept usually wins the follow-on contract.

The winner then proceeds with the next stage -- advanced design -- to fine-tune the concept. This involves detailed engineering, but only on paper since very little testing is funded. Loads, stresses. temperatures, and other expected environments are identified and quantified. There are periodic design reviews of the engineering progress, and audits to monitor expenditures. When the design is optimized and approved, the contractor proceeds with full-scale development. That involves extensive testing. In the case of missiles this means laboratory and field testing to simulate all the environments and forces to be encountered, full-system and component testing, flight testing, and at one time weapons-effect testing at the Nevada Test Site.

When the design has been proven to the satisfaction of the Pentagon's cognizant Program Officers, production can begin and the product eventually enters service. Each of these steps must have a budget approved annually.

2. The British Procurement Process.

The following description of the British procurement process is extracted from *The Safety of UK Nuclear Weapons*, pp. 12 & 13.

The initiation, study and proposal for new military projects generally originates within the sphere of the Deputy Chief of the Defence Staff (Systems) for conventional weapons, and for nuclear weapons the Assistant Chief of the Defence Staff (Policy & Nuclear) who answers to the Deputy Under Secretary (Policy). During study of the new project there is consultation with the Office of Management and Budget and the Programme staff who are responsible for integrating new projects within financial limits. Later during study, extensive discussions take place with appropriate officials in the Procurement Executive and, if nuclear, senior staff in AWE. The final proposal in the form of a Staff Target is prepared under the leadership of staff from the Deputy Chief of the Defence Staff (Policy). In some large projects, such as Trident, there may be several Staff

Targets: submarine, missile, shore facilities, warhead.

New nuclear weapons are also discussed with the Senior Nuclear group which is chaired by the Chief of the Defence Staff and the Permanent Secretary. The function of this group is to coordinate all related aspects of the project: procurement, interaction with other projects, and other aspects of MOD business. But it has no formal executive authority -- it exercises its influence through the positions of its members in other groups.

Eventually the new project starts through a series of stages which closely match those of the US. Each stage further refines the costs, technologies, objectives, and contractural handling of the project. Each is under the management and financial control of the Procurement Executive, who assigns a Project Manager to stay with the project as long as the weapon remains in service. The Ministers, advised by cognizant committees, decide when the project should move from one stage to the next.

First is a Feasibility Study of the Staff Target to determine the range of options and capabilities. As the study progresses the Staff Target evolves into a Staff Requirement. Next comes Project Definition. When a path to completion of the project is clearly seen, it moves into Full Scale Development. Finally comes Production to put the project into service.

B. HOW THE MILITARY BUDGET COMES TOGETHER

The process of putting together a military budget is another area not understood by many people. This simplified explanation may help.

1. *The American Budget Process.*

The military budget process in the US follows a well-worn routine. The US fiscal year (FY) runs from October 1st through the following September 30th. As a new fiscal year begins, Defense Department officials begin outlining the next year's budget. This then goes to the White House Office of Management and Budget (OMB) for integration into the total national budget.

Around the first of February the national budget is presented to Congress. For the Defense Department, there are four main cognizant committees: the Armed Services Committees of both the House of Representatives and Senate, and the Appropriations Committees of both houses. (Occasionally when another committee's jurisdiction is involved, there will be hearings before that committee)

Although presentations and debates in the various committees go on simultaneously, each Armed Services Committee must first vote to *authorize* the appropriation of funds in their house of the legislature. Recently these committees have conducted hearings on the next two fiscal years, rather than just one. Pentagon officials also present a six-year budget plan to show the ongoing picture, and to obtain advance-procurement funds for materials, etc., that take several years to obtain. An example of long-lead items is a supply of special high-strength steel to build a submarine not yet authorized but planned in the future.

Then the Appropriation Committees must vote to *appropriate* the funds for the next fiscal year as well as for advanced procurement. After that the military budget bills are introduced on the floors of the House and Senate, where they may undergo some alterations and have riders attached to meet pet political purposes. Invariably the final House and Senate versions are different. A Joint House-Senate Conference Committee is then set up to bargain for an agreement. Then the budget is sent to the White House for the President's signature. The final version of the budget is usually approved shortly before the fiscal year begins.

It is important to recognize that what appears in the Department of Defense budget is not the total of military spending. Many billions are authorized for the Department of Energy to build hydrogen bombs and nuclear reactor fuel. Other funds are buried in the budgets of agencies which ostensibly do civilian work but also serve military functions. Examples of these are the National Aeronautics And Space Administration (NASA), the National Oceanic and Atmospheric Administration (NOAA), and the National Science Foundation (NSF). Still more is given to colleges and universities for research.

2. *The British Budget Process.*

The British financial year (FY) runs from April 5th through the following April 4th.

[MORE INFORMATION NEEDED ON THIS]

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6.2 JOBS AND THE ECONOMY: ESCAPING THE MILITARY GRIP

America's national debt and national deficit are the subject of much discussion today. At present the national debt is approaching $4-trillion (or to put it in a more understandable way, 4-thousand-billion dollars or 4-million-million dollars!). Government forecasts, which are usually politically based and thus conservative, project a deficit of $350-billion for fiscal year 1992. A more realistic estimate would probably be $400-billion, and that doesn't include rescuing the Savings and Loan Associations which is handled as an "off-budget" item. (Amazing as it may seem, the US government is bailing out the S&Ls but not counting that as part of its expenditures.) That $400-billion deficit would be even worse if the amount owed the Social Security fund were not camouflaged by budgetary slight of hand. Therefore in 1993, when the 1992 deficit is added, the national debt will have risen to about $4.4-trillion ($4.4-million-million).

The health of a country's economy is expressed as the gross national product (GNP), which Webster defines as the total output of a nation's goods and services. Expressed another way, it is the total accumulated spending in that nation. We can see then, that the more times a single dollar or pound is spent, the higher the GNP and the healthier the economy. Going a step further, the more the economic structure of services and manufactured goods promotes ripple effects in the spending pattern, the stronger the economy.

Deficit spending during the Reagan and Bush administrations -- that is, borrowing and spending more money than comes in from tax revenues -- has caused the national debt to skyrocket from $908 billion in 1980 to $4,000-billion in 1992. The annual interest on this debt is $300-billion, a payment which has no multiplier (or ripple) effect on the economy, and therefore does nothing to stimulate the GNP. Neither does it provide germane opportunities to ease the unemployment situation. Meanwhile, spending on economically- and employment-inefficient military programs continues.

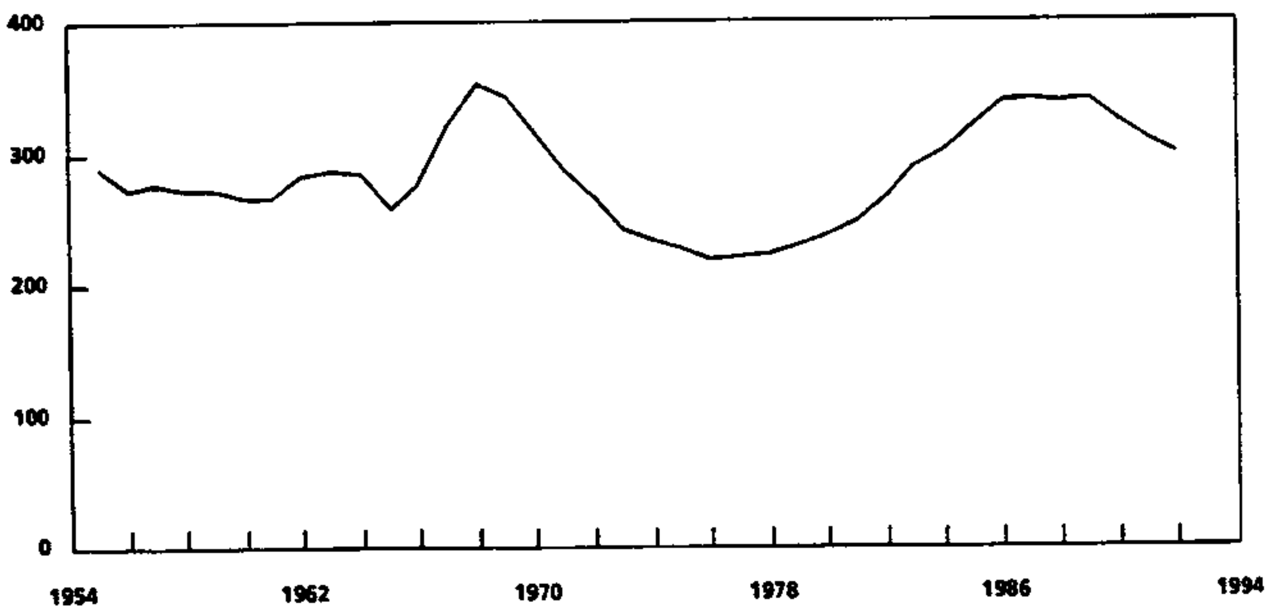
Bailing out the S&L federally-insured accounts could sap $500 billion from the economy by the end of this decade. [Babst, p. 1] Even that vast drain will fade to insignificance if the banks fail. The banks are so large that this nation cannot afford to have them go under. That would be financial destitution for the world's remaining superpower.

A. THE ECONOMIC EFFECTS OF REDUCED MILITARY SPENDING

A characteristic of defense spending is that it is subject to rapid increases and decreases -- it jumps dramatically when a crisis erupts, and is cut sharply when that crisis subsides. To keep defense spending high requires a continual string of crises. That is what the Cold War provided over the past forty years. Now that the Cold War has ended, the Defense Department faces a budget cut. This is recognized by both the White House and the Pentagon.

A February 1992 report by the US Congressional Budget Office (CBO) examines the economic effect of cutting the military budget. [*The Economic Effects of Reduced Defense Spending*.] The Bush administrations 1992-1997 Future Years Defense Program, presented to Congress in February 1991 (hereafter referred to as "the administration's 1991 plan") proposed cutting the Pentagon budget by 20 percent over that five-year period. A year later that was increased to a 29 percent "real" reduction in defense spending by 1997 -- that is, a reduction over and above inflation since 1989. One way to depict a "real" comparison in spending is to convert each years spending to the buying power of the dollar or pound in a given year. For instance, during the Vietnam War America may have spent around $80 billion annually on the military. But, converted to the buying power of the dollar in 1992 (1992 dollars or 1992 prices), that yearly budget could be described as over $300 billion. Figure 6.2-1 illustrates "real" annual military spending during the years 1954-1992, in 1992 dollars.

FIGURE 6.2-1
NATIONAL DEFENSE OUTLAYS
(By fiscal years, in billions of 1992 dollars)



Source: *The Economic Effects of Reduced Military Spending*, p. 2

Currently the US economy (GNP) is between $5.5 and $6 trillion a year. The CBO report states that military spending constituted 6.4 percent of the US GNP in 1987, and 5.5 percent in 1990. The administration's 1991 plan would reduce that percentage of GNP to 3.6 by 1997. The savings is the so-called peace dividend.

This peace dividend, according to the CBO, if spent to improve the nations productive physical and/or human resources could lead to a permanent $50-billion increase (1992 dollars) in the GNP ten years from now. But the immediate effects would be darker. Reallocation could take place in three ways to stimulate the economy over the long haul:

a. Spending on public facilities such as roads and ports, and on education and training, can enhance productivity in the private sector.

b. Use the funds to reduce the national debt which would in turn lower interest rates, increase domestic investment, and lessen foreign indebtedness.

c. Tax cuts or tax incentives aimed at stimulating investment or research & development activities.

The immediate effect of long-term-GNP stimulation would be a decrease in military-related jobs, 300,000 by 1993 and 800,000 by 1995. But there would be a gradual increase in civilian-oriented jobs such as home building and machinery production. These would eventually absorb and surpass the military-related jobs lost and, after 1998, the shift away from defense will result in more jobs than if no cuts had been made. If the military-spending reductions of the administration's 1991 plan were increased, this short-term/long-term pattern would be the same but the magnitude would increase proportionately.

On the other hand, the CBO warns that if the peace dividend is used to stimulate immediate consumption, things would look brighter in the short run, but long-term investment would not take place and long-term GNP stimulation would be lost. The money which would have been used for long-term investment would have been used to promote private consumption.

The US Office of Technology Assessment also published a report in February 1992 which examines the effect of military-spending cuts on the job market.

B. THE EMPLOYMENT EFFECTS OF REDUCED MILITARY SPENDING

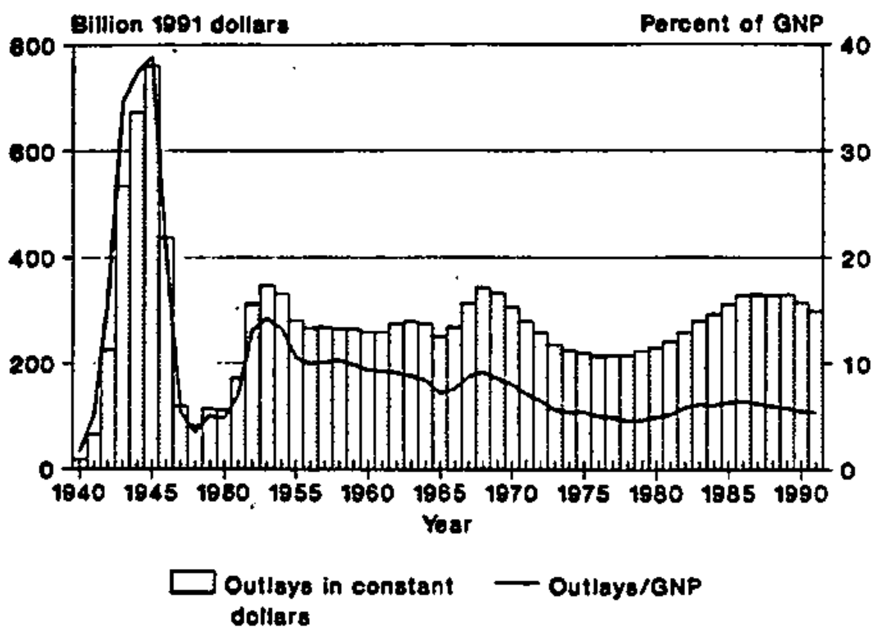
Past decades have been replete with studies showing that money invested in civilian production stimulates a better economy and provides more good-paying jobs than when it is invested in military contracts. Investing a given amount in missiles, for example, does not create the same spending activity on goods and services as would investing that amount in transportation. Military contracts do provide some subsequent spending but not to the degree of civilian production.

The US Congressional Office of Technology Assessment (OTA) reports that in 1991 there were six million Americans employed by private defense contractors, as active duty military personnel, and as Defense Department civilian workers. That is 5.1 percent of the national employment of 118.4 million. If defense spending were cut 40 percent from its present level by 2001, that would be an average decline of $12 billion per year over ten years -- not large in context with an economy running between $5.5 and $6 trillion a year. Defense related jobs would be reduced to about 3.5 million in 2001, or cut an average of 250,000 a year -- only about two-tenths of 1 percent (0.2%) of the total job market. [OTA-ITE-525, p. 1]

Averages are misleading and this decline may not be evenly distributed over the ten years. It may have steep drops over short time periods. Also, areas where defense contracts are concentrated will be hit harder (some 160 of the nation's 3,137 counties are highly defense dependent). In addition, against the backdrop of rising unemployment in the civilian sector, the loss of defense jobs would have a more serious effect on the economy. However, the OTA points out that programs for retraining and reemployment help for displaced workers and armed forces veterans can smooth the transition to a civilian-based economy. But the prospects of such programs will depend most fundamentally on growth in the national economy. [OTA-ITE-525, pp. 1 & 2]

FIGURE 6.2-2

DEFENSE SPENDING, 1940-1991



Source: OTA-ITE-525, p. 2

Although the Reagan and Bush administrations dramatically increased the national deficit, defense spending during the peak of those years never reached the percentage of GNP that was experienced during the Vietnam and Korean Wars, and particularly World War II. This is illustrated in Figure 6.2-2 with spending converted to the buying power of 1991 dollars. Neither will military spending be diminished so fast as after those wars. What makes present circumstances so critical is that the economy is not as robust as it was in previous defense build-downs. Let us examine those circumstances.

JOBS AND THE ECONOMY

1. The Post World War II Years.

I have often been guilty of saying that the rapid conversion from building tanks to building refrigerators after World War II illustrates that corporations can and will convert to a civilian-based economy when that economy offers a market for goods. That is true to a certain degree but the post World War II analogy isn't that simple.

The conversion was dramatic, there is no doubt about that. In just three years (1945-1948, see Figure 6.2-2) defense spending in constant (equivalent) 1991 dollars fell from some $750 billion annually to less than $100 billion, from 36.7 percent of GNP to only 3.2 percent. Defense spending has never since reached that low. Some 12.4 million defense jobs were cut, 10.6 million service men and women were discharged, and 1.8 million civilian defense employees left their jobs during that period. Yet this period was the onset of prosperity and economic growth. Why?

Several nascent conditions came to life to stimulate the economy:

-- Consumers had built up wartime savings and there was a pent-up demand for goods and services.

-- Wartime profits and low taxes of private firms motivated expansion and thus employment.

-- Government plans as early as 1943 for speedy termination of military contracts and contractor reimbursement when the war ended.

-- Liberal wartime tax amortization policies which allowed corporations to depreciate plant expansion and equipment in just five years.

-- Banks were glutted with individual savings and were ready to make low-interest loans to industry.

-- Some 80 percent of manufacturers had saved their pre-war tooling, and simply took it out of mothballs rather than having to re-tool for civilian production.

-- This ambitious reconversion created millions of new jobs.

-- About 3 million wartime workers did not seek new jobs. Older workers who stayed on because of the war retired, and many younger workers went back to school.

-- Approximately 2.7 million women dropped out of the work force.

-- The average work week declined from 45 to 42 hours.

-- Federal and state "GI Bills" provided veterans with up to one year ($52 per week for 52 weeks) of unemployment benefits and four years of paid education.

In short, a repressed economy was unleashed to flourish. And the military-industrial complex had not yet been born with the cold war. Another important factor was that the devastation of war was not experienced in the United States. US manufacturing capabilities were intact and expanding. America was the undisputed, unchallenged and unequalled industrial giant.

2. After the Korean War.

Reconversion was more difficult after the Korean War, but neither were the adjustments so drastic. Military spending in constant 1991 dollars dropped from something like $350 billion in 1953 to about $260 billion in 1956 -- from 13.4 percent to 9.4 percent of GNP in three years. (See Figure 6.2-2) The economy fell into a recession in 1954 but recovered slightly in 1956 and 1957, only to fall into another recession in 1958 when unemployment reached 6.8 percent.

Aside from Korean War veterans receiving essentially the same "GI Bill" benefits, the post World War II conditions that stimulated the economy were absent. There were no government fiscal provisions to offset rapid reductions in military contracting, no economic stimuli from accumulated savings, no special programs to help defense industries and workers adjust.

Recession effects were felt rather generally over the entire country and were not concentrated in certain areas of high defense spending. It took the Cold War to revive the economy into a permanent wartime economy. Many defense industries and workers found business opportunities and employment designing the sophisticated weapons and equipment needed for a strategic first-strike capability.

3. After the Vietnam War.

Although the peak military spending of $342 billion (1991 dollars) in 1968 was about the same as the Korean War peak, the similarities end there. This spending was not as large a portion of the GNP as during the Korean War and the tapering off was not as pronounced -- it fell from 9.2 percent of GNP in 1968 to 5.6 percent in 1974. (See Figure 6.2-2)

During those same years there were 1.4 million defense jobs lost, a 1.4 million reduction in the armed forces, and a reduction of 250,000 Defense Department civilian employees. Unlike the widespread economic impact after the Korean War, the effects this time were particularly hard on the aerospace industry and the regions depending on it. Government programs to offset reductions in wartime spending were scant and initiatives to encourage large companies to enter civilian production were mostly unsuccessful.

The Nixon-Kissinger doctrine of detente with the Soviet Union slowed the Cold War and thus provided less stimulus to the post-Vietnam economy. In addition, the Nixon administration policy of fiscal restraint to offset inflation brought on a sharp recession during 1970-1971. The more pronounced recession of 1974-1975 was caused mainly by the oil-price shock but the policy of detente may have aggravated it.

4. After the Cold War.

The Congressional Office of Technology Assessment has summed up our present economic condition and future options in two sentences: "Granted, military spending is an expensive, unreliable, and unfocused way to provide support to technologies and industries of great commercial importance, but we have relied on it for many decades. If national defense shrinks as an exemplary source of jobs for minorities, if its support for the generation of advanced technologies and industries declines, and if no other institutions are created to take on these responsibilities, then the Nation will be poorer." [OTA-ITE-525, pp. 3 & 4] The last phrase -- other institutions created to take on these responsibilities -- provides the key to not only preventing our nation from becoming poorer in the absence of a permanent military economy, but also to what will make our nation richer in more ways than just economic.

There were 20.1 million new jobs created during the 1970s and 18.8 million during the 1980s. To achieve a 40 percent reduction in military spending there will be 2.5 million fewer defense jobs during the 1990s. The ideal goal would be to have those defense jobs generate new civilian jobs quickly so as not to reduce the net job growth over the decade. This would soften the immediate impact until taken over by the economic growth which will eventually occur after we depart from a permanent war economy.

One possible example is in the Department of Energy. DOE Secretary James Watkins says there are 57,000 workers in the US national laboratories -- about two-thirds manufacturing weapons and the other third working on environmental clean up. The DOE plans to consolidate its fifteen nuclear-arms-production sites to five by 1996. The number of workers will remain the same except they will be split 50-50 between weapons work and environmental clean up. [*SJMN*, 17 Dec 91, p. 5A] That is a 25 percent reduction in weapons workers over 4-5 years with no job losses. It may be that cleaning up the mess made by the military will be the best prospect for immediate-future civilian jobs.

Many factors which helped past transitions from a wartime economy to civilian production are not present today:

- The present sluggish economy precludes any substantial increase in government spending in the civilian sector and/or reduction in taxes.
- Many military contractors have no civilian business to go back to, and have no motivation or expertise to convert to civilian production.
- Money for investment is scant and personal savings reached an all-time low in the 1980s.
- The need to control the national deficit leaves little room for expanding fiscal policies.

Still, the picture is not all bleak. Other things favor departure from the permanent war economy. The transition is considerably smaller than in past military build-downs. Some military contractors also produce a civilian product line which could be expanded. The number of states and counties dependent on military work is not large, and that dependency is lessening. The DOD's Office of Economic Adjustment coordinates federal technical assistance and economic-development grants to communities hurt by military cutbacks. Federal programs exist, and can be expanded, which help workers and communities adjust to economic disruption. There are government policy choices which would support growth of a healthier economy. Public investment in environmental protection, advanced transportation, and improved communication systems would support new business and create jobs. The main ingredient lacking seems to be public determination to depart from the Cold War economy.

President Bill Clinton has pledged to cut an additional $60 billion from the Bush administration's defense spending plan over the next five years. Most of that would be from troop and personnel cuts, rather than the weapons industry. Nevertheless, predictions by electronic industry officials are that weapons-related spending will plummet by 30 percent in the next decade, from $281 billion in 1992 to $197 billion in 2002. Other studies show that defense industry and military jobs will decrease by 1,067,000 between 1992 and 1997. The worst years will be 1993 and 1994 -- down 362,000 jobs in private industry alone during 1993, and 233,000 jobs less in 1994. The OTA agreed that in 1993 some 344,000 defense industry workers, 95,000 military personnel, and 20,000 civilian employees of the Defense Department would lose their jobs. Meanwhile Congress is under increasing pressure to make cuts in the strategic nuclear triad, possibly even to the point of removing entirely the bombers and silo-based ICBMs. Will Trident come through unscathed again?

C. TRIDENT AND THE BRITISH JOB PICTURE

This section will be paraphrased from a 1992 report by the House of Commons Defence Committee. [HC-337, p. xi] It illustrates the inefficiency and deception regarding the jobs generated by the British Trident program.

In October 1980 the MOD informed the Defence Committee that during the peak years (1985-1990) the Trident program "might sustain up to 25,000 jobs annually in the construction, shipbuilding and engineering industries..." Another 20,000 jobs could be supported indirectly in supporting industries -- iron and steel production, electrical engineering, the electronics industry, etc.

The key phrase was "might sustain up to." The "might" was problematical and the number never did get "up to" what was implied. By 1985 the estimate significantly reduced to 17,000 direct and 15,000 indirect jobs during the peak years. Over the entire program the average number of jobs was forecast to be 9,000 direct and 7,000 indirect.

The estimate plummeted again in 1988 -- now 15,000 direct and 12,000 indirect jobs during the peak year.

In 1992 the MOD tried another way to present the job picture. It said that "on average" Trident will provide 14,500 direct and 11,500 indirect job opportunities during the peak years of 1990-1993. "On average" over a three year period is not the same as continuously sustained over that period. Furthermore, the average employment provided over the entire Trident procurement period had also fallen -- from 9,000 direct/7,000 indirect to 7,000 direct/5,500 indirect.

The Defence Committee noted that: "Estimates of the overall number of UK jobs created or safeguarded as a result of the Trident programme have broadly been halved over the past ten years, in contrast to expenditure in the UK which has risen substantially in proportion to expenditure in the US." [HC-337, p. xi]

The Defence Committee foresaw in 1988 that Trident would require less than half the personnel at RNAD Coulport than does Polaris. In 1992 the MOD reached the same conclusion, reporting that because the missiles will be serviced at Kings Bay, Georgia, along with other factors, Trident will need only about half the staff at RNAD Coulport than Polaris now requires.

Furthermore, aside from making RNAD Coulport the sole point for servicing Mark-24 Tigerfish torpedoes, the MOD has been unable to find alternative employment for the jobs that will be lost. In its 1992 report the Defence Committee served notice that the "experience of watching these [job] figures fall confirms our attitude of skepticism towards estimates of employment generated by defence expenditures." [HC-337, p. xi]

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[MORE INFORMATION ON THE BRITISH ECONOMY WOULD BE WELCOME]


LOCAL INTERVIEWS:
Saturday, December 15th
CALL: 692-4531
Wednesday–Friday

6.3 SAVINGS FROM HALTING THE US TRIDENT

This is the fourth edition of this chapter since it was first written in 1993. Each year the potential savings goes down because the Trident program is nearing its end. But very important -- and not to be overlooked -- is that there have been savings along the way. A good share of this can be indirectly attributed to the global movement for peace and justice bringing the cold war to an end. Even more of this can be directly attributed to the Anti-Trident Network's persistent drive to keep Trident in the forefront of citizen and legislative debate -- something that does not easily happen with a system hidden in the vastness of the oceans and far removed from general consciousness. Headway toward stopping Trident has been made! We must not forget that.

Pentagon officials have recognized the anti-Trident trend and now present the appearance of voluntarily curtailing the program. In September 1994 the Defense Department's Nuclear Posture Review recommended that Trident subs be cut from 18 to 14. These recommendations were accepted by the Clinton administration, although the four oldest subs will not be retired until the START-2 Treaty becomes fully effective in 2003. But Navy plans to retire the four oldest submarines do not provide the savings that first seems apparent. The plan also provides that the remaining four Trident-1 submarines be converted to carry Trident-2 missiles. That requires modification of those subs, conversion of Sub-Base Bangor to handle Trident-2 missiles, and manufacture of more Trident-2 missiles.

In the short term, presumably to soothe public opinion, the Navy has also cut back on production of Trident-2 missiles. In February 1993, the proposed FY-1994 buy of 39 Trident missiles was reduced to 24. A year later the FY-1995 Trident budget was reduced from a previously-planned 24 missiles to 18 -- with plans for 12 thereafter. But that was further reduced in the FY-1996 budget request -- six for that year with seven planned for FYs-1997 through 1999. Of course the British plan to order seven for each one of those last three years also, making a total of 14 yearly.

Even this apparent cutback in US missile orders is deceptive. The Navy has come up with a concept of "Incremental Procurement," ostensibly to quantity-buy critical components and rocket motor sets from subcontractors for a cheaper price. Critical components include missile nose fairings, nose caps (presumably for the reentry vehicles), major components for the post-boost control system which dispenses the multiple warheads to their targets, and the missile equipment section. Motor sets include rocket motor assemblies for all three stages. Everything else comes under the heading of non-critical components. In 1996 dollars, a missile set of non-critical components costs \$4.67 million each, a set of critical components \$9.5 million each, and \$6.67 million for a set of motors. Besides what is necessary for the six missiles ordered in FY-1966, the Navy also ordered an additional 9 sets of critical components and 18 extra sets of motors. Over the next six years, in addition to the 72 complete missiles scheduled to be purchased in FYs-1996 through 2001, an additional 29 sets of critical components and 45 extra motor sets will be ordered. The short-term cutback is not cut back as far as the Navy would like us to believe.

Actual missile orders will pick up again after the turn of the century. In FY-2000 the US orders will jump to 12 annually through FY-2004, and then 10 for FY-2005. From FY-1997 on, that adds up to 112 more missiles to be bought for both the US and Britain, but most of the major parts for those missiles will be procured in the short term. FY-2005 will be the last of the Trident-2 missile program unless the submarine service life is extended to 40 years -- another gentle way of slipping it to the public that the Navy and Lockheed Martin plan extensive missile production.

So there is still plenty of resistance to offer and a lot of savings to be realized. The anti-Trident pressure must not relax. If the four older subs remaining, if the Navy actually cuts back to 14, were not converted to carry Trident-2 missiles there would be a savings in not retrofitting as well as an automatic end to the need for more missiles. Better yet, if nine submarines were retired instead of four, the US could still "stay up" to START-2 allowances, save retrofit costs, and have a surplus of Trident missiles -- even the British wouldn't have to order more.

Last year this chapter examined only the difference between what the Navy's 14-sub plan would cost over the lifetime of the Trident fleet, and an alternative plan that would accommodate the same number of warheads. That was when it was implied that the four older subs would be taken out of service immediately and kept in mothballs until 2003. Now it appears that no submarines will be taken out of service until START-2 is fully implemented in 2003. Therefore, the analysis this year will look at the savings between the full 18-sub plan and other alternatives. Trident resisters should keep in mind, however, that bringing the Trident inventory down to the alternatives shown below are only an immediate first step toward eliminating Trident completely.

START-2 requires that sea-based strategic warheads be reduced to 1,750 maximum. [See Appendix G for an explanation of the START treaties] The US at first settled on 1728 which is half its original plan. That would mean four warheads per missile instead of eight. If and when the 14-sub program is implemented the total warheads will number 1680 (5 warheads per missile). Reductions are to be completed by 2003.

Common sense tells us that with only half the deployed warheads the Navy needs only half the number of submarines and half the number of missiles. The missiles would still be loaded to their full capacity of eight warheads. The official argument against doing this is that START-2 has already been negotiated for four warheads per missile, and it would require renegotiation of the treaty. That is deception because the treaty sets up a commission to handle such changes. This deception became apparent with the 14-submarine plan in which each missile would carry five warheads. That change would also have to be submitted to the commission. It would be just as easy -- even easier because verification would be simpler -- to stay with eight warheads per missile and simply cut the submarines back to nine. So much for START-2 considerations. Now let us look into saving some money.

A. SAVINGS FROM NOT BACKFITTING FOUR TRIDENT-1 SUBS

In a 9-sub fleet were planned, all Trident-1 carrying submarines would be removed from service. It would not be necessary to backfit Trident-2 missiles into any of them.

For an 18- or 14-sub fleet, however, the US Navy has long argued that Trident-1 missiles remaining in service beyond 2004 would have to be equipped with new motors. Navy officials say it would be cheaper in the long run to replace them with Trident-2 missiles. However, a Pentagon-commissioned study by the New York based Reliability Analysis Center of the IIT Research Institute arrived at a different conclusion. Its 6 November 1992 report entitled "Trident C-4 Missile Life Extension Study" said the currently-deployed Trident-1 missiles could safely and effectively be used until 2016, when the last Trident-1 equipped submarine reaches the end of its service life. The report recommended against re-motoring the existing missiles or replacing them with Trident-2 missiles.

Cancelling backfit of four Trident-1 subs in a 14-sub fleet would save $1.1 billion, in 1996 dollars, in submarine work alone. [*Inside The Pentagon*, 4 February 1993, adjusted for four submarines and updated to 1996 dollars]

B. SAVINGS FROM REDUCING THE NUMBER OF SUBMARINES FROM 18 TO 9

The number of deployed SLBM warheads planned for the US under START-2 would only require nine submarines. The eight Trident-1 submarines and one of the Trident-2 submarines could be retired, say, by the end of FY-1996, (which is 30 September 1996). Assuming a 30-year service life [SASC-92], some 165 submarine-years of operation would be cancelled, as shown:

USS Ohio	15 years
USS Michigan	16 years
USS Florida	17 years
USS Georgia	18 years
USS Jackson	18 years
USS Alabama	19 years
USS Alaska	20 years
USS Nevada	20 years
USS Tennessee	22 years
Total:	165 years

At $77 million per submarine-year for operation, maintenance and support, **the savings would be $12.7 billion in 1996 dollars.** (The operating, maintenance and support costs for one Trident submarine over its 30-year service life is $2.3 billion, the annual cost is then $77 million.)

In the shorter six-year term, FY-1997 through FY-2002, the savings is $4.2 billion in 1996 dollars. (9 submarines x 6 years x $77 million = $4.2 billion.)

C. SAVINGS FROM REDUCING SUBMARINE BASES TO ONE.

With only a 9-sub fleet, all the submarines could operate from one base. With the range of Trident missiles, there would be no problem reaching any perceived target. That means Sub-Base Bangor would not have to be converted to accommodate Trident-2 missiles. The savings would be $253 million according to a 1989 Pentagon budget proposal.

[*Seattle Post-Intelligencer*, 22 September 1994, p. A12] **That would amount to $309 million savings in 1996 dollars.**

D. SAVINGS FROM CANCELLING TRIDENT-2 (D-5) MISSILE PRODUCTION

By the end of FY-1996 there will be 343 Trident-2 missiles bought or ordered for the US. According to the US Navy, there have been 80 Trident-2 missiles flown as of 19 January 1995. Assuming another 4 were used during the past year, that would mean 84 of the 343 were expended -- leaving 259 on submarines or in storage. That number (259) is enough to carry the 1,728 SLBM warheads planned under START-2 with 43 left over for testing and spares.

Current Navy plans are to procure an additional 91 US missiles from FY-1997 on. The six missiles ordered in FY-1996 will cost $55.3 million each. [Hall, Raymond J., *Selected Weapons Costs from the Administration's 1996 Program*, modified per a telephone conversation with Raymond J. Hall of the Congressional Budget Office.] Assuming that the unit cost will remain somewhat the same, **the savings from not producing the 91 missiles planned after FY-1996 would be $5.03 billion** (91 missiles x $55.3 million per missile = $5032.3 million).

To figure savings for the shorter 6-year term, FY-1997 through FY-2002, it will be assumed that the "Incremental Procurement" (pre-buying rocket motor sets and critical components) will be complete by 2000. From FY-1997 through FY-2000 the Congressional Budget Office total spending figures will be used. For FY-2001 and FY-2002 the number of missiles planned times the $55.3 million unit cost will be used. **The six-year savings from cancelling Trident-2 missile production at the end of FY-1996 is $3.1 billion in 1996 dollars.** It is broken down as follows:

	FY1997	FY1998	FY1999	FY2000	FY2001	FY200	Total
Missiles cancelled	7	7	7	12	12	12	57
Savings (millions)	$359	$362	$407	$628	$664	$664	$3084

E. COUNTERING THE JOBS LOST

The only production jobs lost under the 9-sub plan would be in missile construction. Not more than 4,000 Lockheed Martin Missiles and Space Company (LMMS) employees are producing Trident-2 (D-5) missiles -- most of them at the main Sunnyvale, California plant. That number of jobs being terminated sounds threatening, but when seen in perspective it is not as serious as one might assume. The 4,000 Trident-2 jobs is less than 0.032% of California's 12.45 million jobs.

The transition away from military spending is inevitable. A Congressional Budget Office study illustrates how a few austere years are unavoidable in weaning our economy from its military dependency. But in the long run, if the savings are properly spent, the economy will be stronger and the gross national product higher than if military spending had been continued. [See *The Economic Effects of Reduced Military Spending*.] Furthermore, government-sponsored programs, funded by part of the savings, can make the transition to a civilian-based economy less stressful for the more critical regions. [See OTA-ITE-525]

California, where Trident missile work is concentrated, is one of the most critical regions. That state once received about a quarter of America's military contracting dollars. Consequently, it was hardest hit by defense layoffs. Between 1990 and 1993 California lost 700,000 jobs. Its unemployment rate soared to 10% in 1993 while the US average was 7.1%.

But the austere years are behind us. While California's current 7.7% unemployment is still significantly above the national average of 5.6%, it has improved considerably. Now the California Department of Finance, known for its conservative estimates, predicts that by the end of 1996 the state will have recovered its 1990 pre-recession peak of 12.7 million jobs. The economy can stand the demise of Trident employment.

F. CONCLUSION

Over the life of the Trident fleet, the savings of the 9-sub plan over the 18-sub plan is $19.1 billion in 1996 dollars, broken down as shown:

-- Not backfitting four Trident-1 subs:	$ 1.1 billion
-- Reducing number of submarines from 18 to 9:	12.7 billion
-- Reducing submarine bases to one:	0.3 billion
-- Cancelling Trident-2 missile production:	5.0 billion
Savings over life of Trident fleet:	$19.1 billion

In the shorter term, over the next six-years, FY-1997 through FY-2002, the savings would be $7.3 billion in 1996 dollars, broken down as shown:

-- Reducing number of submarines from 18 to 9:	$ 4.2 billion
-- Cancelling Trident-2 missile production:	3.1 billion
Savings FY-1997 through FY-2002:	$ 7.3 billion

These are remarkable savings for stopping something which will immediately become surplus under START-2 -- and which is already obsolete, even from a military viewpoint, in the post-cold war era.

A few thousand lost jobs will be an immediate hardship but jobs-lost compared to savings-gained is a very favorable ratio. Cancelling Trident-2 missile production yields a savings of $3.1 billion over the next six years. Yet the jobs cancelled would only raise California's unemployment figure by 0.032%. That is assuming that all the 4,000 jobs lost would result in unemployment, which would certainly not be the case. It can be expected that at least half would be from attrition. And the other half could certainly be compensated by jobs created in other areas.

imagined threats which keep the weapons business flourishing must be examined with a cynical eye. The real reason Trident continues is because arms manufacturers have a powerful lobby in Washington. It is time for American citizens to make their desires felt. It is time to make democracy work. And it is time to spend for justice instead of killing. In the meantime we will come closer to balancing the federal budget.

* * * * *

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In April 1994 that projection was revised upward to a 2,900 reduction in work force. Half of that number is expected to be through normal attrition, retirement, etc.

The 4,200 Trident-2 jobs is less than 3.5/100ths of one percent of California's 12.173 million jobs. That would present a very slight addition to some 1.5 million unemployed in the state. To aid in overcoming that burden the Clinton administration's FY 1994 budget request reports $1.92 billion for defense conversion efforts -- up from 200 million in FY 1991.

Similar conditions exist where Trident submarines are being built. At the beginning of 1993 some 17,000 were working for Electric Boat Division of General Dynamics Corp. -- 13,500 at the Groton, Connecticut facility and 3,500 at Quonset Point, Long Island. Not all of them were working on the Trident program, some were working on fast attack submarines. 2,200 employees left Electric Boat employment during 1992, possibly 1,200 from attrition and 1,000 due to lay off.

At the Groton facility alone, 1,500 workers left Electric boat during 1993, approximately 800 of them from layoffs. That leaves the Groton work force at 12,000. The projected reduction for 1994 is 4,000, which will reduce the Groton work force to 8,000. How much of that reduction will come from layoffs is unknown. Further projections indicate the work force will be down to 7,500 in three years. It is possible that the Quonset Point, Rhode Island facility may be closed in three years. [Credit goes to Stephen Kobasa for providing figures on Electric Boat.]

The Groton, Connecticut region is one of the nation's most dependent on military contracting. Nevertheless, the Congressional Office of Technology Assessment estimates that during the 1990s as many as 2.5 million of America's 6 million defense-related jobs may disappear. That is 250,000 a year, but only 0.2 percent of the US employed work force. Given the size of the US economy, although currently weak, that adjustment is modest compared to past military build-downs. Furthermore, government-sponsored programs can make the transition to a civilian-based economy less stressful for the more critical regions. [See OTA-ITE-525]

The transition must come and it has already begun. A Congressional Budget Office study illustrates how a few austere years are unavoidable in weaning our economy from its military dependence. But in the long run, by the end of the 1990s, if the savings are properly spent, the economy will be stronger and the gross national product higher than if military spending had been continued. [See *The Economic Effects of Reduced Military Spending*.]

E. CONCLUSION

Between $21.72 and 24.18 billion can be saved over the long term by implementing "A," "B," and "C" above, depending on how the submarine force is reduced to nine. During the six-year period (fiscal years 1995-2000) it is possible to save between $6.48 and $7.64 billion, again depending on how the sub fleet is reduced. That would be a great contribution to the Clinton administrations goal of trimming military spending. In FY 1995 alone, it is possible to save from $1.11 to $1.60 billion.

These are remarkable savings for stopping something which will immediately become surplus under START-2 -- and which in fact are already obsolete, even from a military viewpoint, in the post-cold war era.

A few thousand lost jobs will be an immediate hardship but government-sponsored programs, financed by part of the savings, can lessen the sting. However, when comparing the jobs lost to the savings, the ratio is very favorable. For instance, cancelling Trident-2 missile production yields a savings of three-quarter billion dollars in FY 1995 alone -- and almost $3.23 billion over the next six years. Yet the jobs cancelled would only raise California's unemployment figure by .0028 percent. That is assuming that all the 4,200 jobs lost would result in unemployment, which is certainly not the case. It can be expected that at least half would be from natural or motivated attrition.

By the turn of the century, however, the money saved from Trident will create considerably more good-paying jobs than would have been generated by Trident production. America's economy will grow stronger and suffering will be alleviated for many who have been victims of military spending for so long.

Imagined threats which keep the weapons business going must be examined with a cynical eye. The real reason Trident continues is because arms manufacturers have a powerful lobby in Washington. It is time for American citizens to make their desires felt. It is time to make democracy work. And it is time to spend for justice instead of killing. Some of this goal has been achieved during 1993.

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SECTION 7
NUCLEAR WEAPONS
INVENTORIES

7

7.1 NUCLEAR WEAPONS OF THE US

Nuclear weapons deployed by the US are relatively easy to determine because they are announced and observable. Nuclear weapons which have been removed from service and stored are not as easy to keep track of. For instance, the INF treaty specified that ground-launched cruise missiles and Pershing-2s removed from Europe were to be destroyed. But the nuclear warheads can be stored or recycled. There is no easy way to determine what warheads are still in the stockpile. In his September 1991 and January 1992 initiatives, President Bush ordered some weapons to stand down from "readiness," and others to be removed from "deployment." Some are to be destroyed and others stored. The status of these weapons is also indeterminable without some sort of civilian verification method. So this chapter will be a best-effort to outline the US nuclear potential. Further advice and input is welcome.

A. AMERICA'S STRATEGIC NUCLEAR TRIAD

The United States has since the outbreak of the cold war operated a strategic nuclear triad of weapons which can be launched from land, air, and sea. Today the land and air components of this triad have been ordered to stand down. The sea-based portion, however, remains virtually untouched.

1. *ICBMs — The Land Leg.*

Silo-based inter-continental ballistic missiles (ICBMs) compose the land leg of the triad. They are broken down to 50 MX missiles (euphemistically dubbed "peacekeeper" by the Reagan administration) and 500 Minuteman-3 missiles.

a. **Missile-X (MX).** Fifty MX missiles have been deployed in converted Minuteman-3 silos. Each missile carries ten Mark-21 MIRVs. Each MIRV carries a 330-kiloton W-87 bomb. Under the START-2 Treaty, all of these MX missiles will be removed.

b. **Minuteman-3.** 200 Minuteman-3 ICBMs carry three Mark-12 MIRVs each. Each MIRV encases a 170-kiloton W-62 bomb. The other 300 Minuteman-3s have been refitted with three Mark-12A MIRVs each, and each of these MIRVs hold a 335-kiloton W-78 bomb.

Under START-2, all Minuteman-3 missiles will have their payload reduced to one warhead each. The 500 Mark-21/W-87 warheads removed from MX missiles will be used for this purpose on Minuteman-3, as they have advanced safety devices.

450 Minuteman-2 missiles have been removed from service and their silos will be destroyed by 1999, per START-2.

2. Bombers and Cruise Missiles -- The Air Wing.

Three types of heavy, long-range bombers make up the air wing of the triad -- B-52Hs, B-1Bs, and B-2s. These bombers can carry gravity bombs or air-launched cruise missiles (ALCMs). The new advanced cruise missile (ACM), of which some have been produced, is interchangeable with the older ALCMs.

Per the September 1991 initiatives, strategic bombers have been taken off 24-hour airstrip alert and their weapons stored. Under START-2, a substantial portion of the strategic bomber force will be converted to primarily conventional use.

a. **B-52H High-Altitude Bombers.** There are currently 94 B-52H bombers in the strategic forces -- all B-52G bombers not retired have been converted to carry conventional weapons.

B-52H bombers can carry 20 ALCMs each (12 externally under the wings and 8 internally on the rotary launcher). The internal load can be twelve B-53/B-61/B-83 bombs instead of ALCMs.

b. **B-1 Supersonic Bombers.** B-1B supersonic bombers now number 95. They carry weapons internally only, on three rotary launchers. Their capacity is 22 ALCMs or 36 B-61/B-83 nuclear bombs. B-1B bombers will be converted to carry only conventional bombs by 1998.

Five B-1As were once built and one crashed. These aircraft apparently never entered service.

c. **B-2 Stealth Bombers.** Original plans for 132 B-2 radar-evading bombers have been reduced to 20 plus one test aircraft (prototype). The B-2 does not fly faster than sound as many believe. It is a slow, lumbering aircraft which is a high-tech resurrection of the flying wing from the 1950s, built by the same company. The first operational B-2 was delivered to Whiteman Air Force Base, Missouri, on 17 December 1993. All 20 are to be operational by 1998.

B-2s will be able to carry 24 of the follow-on short-range attack missiles (SRAM-2) or 24 nuclear gravity bombs. SRAM-2s, of course, have now been cancelled. Also, in October 1992, the 4th B-2 made a practice drop of a Mark-4, 2,000 pound bomb -- the biggest used in the Persian Gulf war. So a conventional role is also possible for the B-2. Since the stealth fighter was reported as a success in Iraq, perhaps the Pentagon thinks a stealth bomber will be better.

3. SLBMs -- The Sea Leg.

The sea leg of the US strategic triad is now made up of Trident-1 (C-4) and Trident-2 (D-5) submarine-launched ballistic missiles (SLBMs) carried of 16 Trident submarines. Two more submarines to carry the D-5 missiles will be delivered by 1997. Navy plans are to reduce the strategic submarine force to 14 ships, all carrying D-5 missiles.

a. Trident-1 (C-4) SLBMs. There are currently 192 Trident-1 missiles deployed in eight Trident submarines (24 missiles each) based at Bangor, Washington on the west coast. Four of these submarines are to be deactivated and the remaining four converted to carry Trident-2 missiles. Plans are to then base seven of the 14 submarines on each coast.

A Trident-1 missile can carry up to eight Mark-4/W-76 warheads. Each has 100 kilotons yield. A lesser number can be installed to achieve a greater range.

b. Trident-2 (D-5) SLBMs. Only about 400 of the 475-kiloton Mark-5/W-88 warheads for Trident-2 missiles were produced before they were cancelled because of production and safety reasons. They are deployed on Trident-2 missiles along with 100-kiloton Mark-4/W-76 warheads, in four of the eight Trident submarines on the east coast -- the other subs carrying Trident-2 missiles are loaded with only Mark-4/W-76 warheads. Two more new Trident subs to carry Trident-2 missiles will be deliverd by 1997.

A Trident-2 missile can carry eight of the 475-kiloton Mark-5/W-88 warheads. It has the ability to carry 12 to 14 Mark-4/W-76 warheads but the START-1 Treaty restricts each missile to eight.

B. US TACTICAL NUCLEAR DELIVERY VEHICLES

Virtually every military fighter, or attack airplane can deliver nuclear bombs. Such short-range air-delivered nuclear weapons, operated by the US Air Force, have not been curtailed by any treaty or unilateral initiative. Land-based and sea-based tactical nukes, as they are called, have been removed by treaty mandate or unilateral initiative. Some have been destroyed and others stockpiled. Deployed tactical nuclear weapons are now restricted to the B-61 gravity, or free-fall, bomb, which has a tactiacal version. US aircraft capable of delivering this bomb are the A-4, A-6, A-7, AV-8B, F-4, F-15, F-16, FA-18, F-111, and presumably the new F-117 stealth fighter. NATO aircraft so capable are the F-4, F-100, F-104, and the Tornado.

C. US NUCLEAR BOMB STOCKPILE

This section has been compiled from public sources. It reflects the active stockpile only, and does not include weapons that are waiting for disassembly at Pantex. The bombs are listed numerically by DOE warhead designation.

B-53, Mod 1 strategic gravity bomb.

YIELD:	9.0 mt.
SAFETY:	OPS & partial ENDS
IOC:	1962, safety upgrade 1988
LABORATORY:	
QUANTITY:	50
CARRIER:	US B-52 bombers.
REMARKS:	No plans to retire last 50.

B-61, Mods 3 & 4 tactical bombs.

YIELD:	100-500 kt. selective yield.
SAFETY:	OPS, ENDS & IHE.
IOC:	1980
LABORATORY:	LANL
QUANTITY:	800 of Mods 3, 4 and 10 combined.
CARRIER:	US F-111, A-4, A-6, A-7, AV-8B, F-4, F-15, F-16, F-18 NATO F-4, F-100, F-104 & Tornado.
REMARKS:	

B-61, Mod 7 strategic bomb.

YIELD:	10-300 kt.
SAFETY:	OPS, ENDS & IHE.
IOC:	1986
LABORATORY:	LANL
QUANTITY:	750
CARRIER:	US B-1, B-52
REMARKS:	

B-61, Mod 10 tactical bomb.

YIELD:	10-175 kt.
SAFETY:	OPS, ENDS & IHE.
IOC:	1990
LABORATORY:	LANL
QUANTITY:	800 of Mods 3, 4 and 10 combined.
CARRIER:	US F-111, A-4, A-6. A-7, AV-8B, F-4, F-15, F-16, FA-18. NATO F-4, F-100, F-104 & Tornado.
REMARKS:	Converted from W-85 Pershing-2 warhead.

W-62 warhead for Mark-12 reentry vehicle on Minuteman-3.

YIELD:	170 kt.
SAFETY:	No safety devices other than OPS.
IOC:	1970
LABORATORY:	LLNL
QUANTITY:	610
CARRIER:	Minuteman-3 ICBM.
REMARKS:	

W-76 warhead for Mark-4 reentry vehicle for Trident.

YIELD:	100 kt.
SAFETY:	OPS & ENDS.
IOC:	1979
LABORATORY:	LANL
QUANTITY:	2,480
CARRIER:	Trident-1 and Trident-2 SLBMs.
REMARKS:	

W-78 warhead for Mark-12A reentry body on Minuteman-3.

YIELD:	335 kt.
SAFETY:	OPS & ENDS.
IOC:	1980
LABORATORY:	LANL
QUANTITY:	920
CARRIER:	Minuteman-3 ICBM.
REMARKS:	

W-80, Mod 0 warhead for sea-launched cruise missile.

YIELD:	200 kt.
SAFETY:	OPS, ENDS & IHE.
IOC:	1984
LABORATORY:	LANL
QUANTITY:	350
CARRIER:	For nuclear Tomahawk SLCMs.
REMARKS:	All stored per September 1991 initiative.

W-80, Mod 1 for ALCM and ACM..

YIELD:	200 kt.
SAFETY:	OPS, ENDS & IHE.
IOC:	1982
LABORATORY:	LANL
QUANTITY:	1200
CARRIER:	B-1 and B-52 bombers.
REMARKS:	

B-83 strategic bomb.

YIELD:	Low yield to 1.2 mt.
SAFETY:	OPS, ENDS, IHE & FRP.
IOC:	1983
LABORATORY:	LLNL
QUANTITY:	3000 produced as of December 1986.
CARRIER:	US B-1, B-52, FB-111A, F-111, A-4, A-6, A-7, F-4, F-15, F-16 & F-18 aircraft. NATO F-4 & F-104 aircraft.
REMARKS:	Apparently two will replace one B-28 or B-43.

W-87, Mod 0 warhead for Mark-21 reentry vehicle on MX missile.

YIELD:	330 kt.
SAFETY:	OPS, ENDS, IHE & FRP.
IOC:	1986
LABORATORY:	LLNL
QUANTITY :	525
CARRIER:	MX ICBM.

W-88 warhead for Mark-5 reentry Vehicle on Trident-2.

YIELD:	475 kt.
SAFETY:	OPS & ENDS.
IOC:	1990
LABORATORY:	LANL
QUANTITY:	400
CARRIER:	Trident-2 SLBM.
REMARKS:	Production halted, partly because of safety problems.

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7.2 NUCLEAR WEAPONS OF BRITAIN

Britain, like the US, possesses both tactical and strategic nuclear weapons. Only Britain does not have near as many. The following is a summary of that country's nuclear capability.

A. BRITISH STRATEGIC NUCLEAR WEAPONS

Unlike the US, Britain does not have a strategic triad. Its strategic weapons are all based in submarines at sea. Britain's strategic nuclear role commenced with the 1962 Nassau Agreement between President John Kennedy and Prime Minister Harold Macmillan, when the US agreed to sell Polaris A-3 missiles to Britain. Britain built four *Resolution* class submarines to carry the missiles (*HMS Resolution*, *HMS Repulse*, *HMS Renown*, and *HMS Revenge*). The lead ship, *HMS Resolution*, entered service in October 1967 and the others followed at about one-year intervals. At first these subs probably carried warheads similar to the 200-kiloton Mark-2/W-58 warheads used on US Polaris A-3s. There were three of these on each missile and they all went to the same target -- exploding in a triangular pattern to create more widespread destruction. In the 1980s the British Polaris fleet was refitted with maneuvering Chevaline warheads. But even with these each missile could only attack one target.

1. Britain's Shrinking Polaris Fleet.

Today Britain has two Polaris submarines still operational -- *HMS Resolution* and *HMS Repulse*. These submarines hold 16 Polaris A-3 missiles each. It is believed that each Polaris SLBM carries two Chevaline warheads which are probably in the 75-100 kiloton range.

Targets would have to be within a range of 2,500 nautical miles because that is the reach of Polaris A-3 missiles. And because of the A-3's poor accuracy, the targets would have to be soft -- such as cities, which are sprawling and vulnerable.

2. Britain's Growing Trident Fleet.

During the 1990s, Britain plans to replace its Polaris fleet with four new *Vanguard* class Trident submarines. *HMS Vanguard* became operational on 13 December 1994, *HMS Victorious* on 7 January 1996. The last two ships, *HMS Vigilant* and *HMS Vengeance*, are expected to become operational in early 1998 and 2000 respectively. British Tridents carry 16 missiles each (not 24 as do US Trident ships) so the number of SLBMs deployed will remain at 64 -- the same as for four Polaris boats. But the comparison stops there.

The new submarines will carry US Trident-2 (D-5) missiles, each loaded with up to eight 100-kiloton warheads. These warheads will be MIRVs, which means they can be sent to separate targets. Thus, rather than each submarine being able to attack 16 targets, as was the case with Polaris, each of the new Trident boats will be able to attack up to 128.

The types of targets will also be different. The accuracy of Trident-2 SLBMs makes them "hard target killers." Hard targets are heavily fortified with concrete and steel and usually buried underground. The ability to threaten another country's command bunkers will significantly destabilize international relations.

More and harder targets is not the end of Trident's capability over Polaris. Trident will threaten such targets over a larger geographic area. Trident-2 missiles are designed to travel slightly over 4,000 nautical miles with eight 475-kiloton bombs. That in itself is a longer reach than Polaris. But the British Trident, carrying smaller and lighter 100-kiloton bombs, should have a range close to 6,000 nautical miles. From its home port on the Clyde, one of these submarines can threaten almost half the globe. Its missiles will reach all of Africa north of the equator except Kenya, Somalia, and part of Ethiopia. The missiles would also reach all of the Mid-East including Afghanistan and Pakistan, and all of the former Soviet Union except the very easternmost part. They would even reach Washington, D.C. and Sub-Base Kings Bay.

B. BRITISH TACTICAL NUCLEAR WEAPONS

In recent years Britain has had a Lance missile and nuclear artillery role. Nuclear warheads for these delivery vehicles were under US control during normal times. But in a crisis or combat the entire nuclear system would have to be under British control. The Lance and nuclear artillery role has now been given up and the units handling such weapons have been disbanded.

The other tactical nuclear weapon in the British arsenal is the WE-177 bomb.

1. Britain's WE-177 Bombs.

From 1966 until mid-1992 Britain had some 200 WE-177 free-fall (gravity) bombs and depth bombs in the Royal Air Force and Royal Navy. The WE-177 is believed to be a copy of the US B-57 gravity/depth bomb which was deployed two years earlier, in 1964. The WE-177 has three models. WE-177A and WE-177B are RAF free-fall bombs with yields of 400 and 200 kilotons respectively. The WE-177C is a Royal Navy free-fall/depth bomb with a yield of 10 kilotons.

On 15 June 1992, British Secretary of Defense Malcolm Rifkind announced that the WE-177 inventory would be approximately halved and they would no longer be deployed at sea under ordinary circumstances. He said WE-177s would be removed, by the end of 1992, from all RN ships, from all of the carrier-based Sea Harrier aircraft, and from RAF maritime patrol planes. That leaves up to 100 WE-177 free-fall bombs for RAF Tornado aircraft based in England and Germany. Plans are to progressively retire the W-177 after the year 2000.

2. *Britain's Tactical Trident.*

To replace the WE-177 bombs, Britain originally planned for a new nuclear air-launched standoff missile called the Tactical Air-to-Surface Missile (TASM). Those plans have now been abandoned in favor of a Tactical Trident.

When *HMS Victorious* left Faslane on 7 January 1996 for its first patrol, it was carrying the first Tactical Trident missiles. Presumably these missiles are loaded with a single warhead which can be used against any country which threatens to use weapons of mass destruction. That includes chamical and biological weapons as well as nuclear. In November 1993, then British Defence Secretary Malcolm Rifkind said the Tactical Trident would be used to give "an unmistalkeable message of our willingness to defend our vital interests to the utmost." [Cited in *Heddwch*] That is far from a "No First Use" pledge. Those vital interests that the Tactical Trident is to protect were spelled out in Britain's 1995 Defence White Paper: "We have global interests and responsibilities ... As a nation we live by trade and investment ... Our manufacturing industry is dependent on raw materials from overseas. Our global investments are estimated to be worth around $300 million." [Cited in *Heddwch*]

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7.3 NUCLEAR WEAPONS OF FRANCE

France has been described as a nuclear wild card in Europe. She emerged as the world's fourth nuclear power on 13 February 1960. Although a charter member of NATO, French President Charles de Gaulle in 1966 withdrew French armed forces from integration with NATO, and NATO bases were removed from French territory. De Gaulle started deploying France's own independent nuclear forces the following year, allegedly through dictatorial powers and without consultation with parliament.

Some observers say De Gaulle's action was in response to NATO abandoning "massive retaliation" as its nuclear policy, and shifting to the more-gradually-escalating "flexible response" doctrine. That may have been part of the reason, but competition with US dominance of NATO certainly figured into the picture. Whatever the reason, France's *force de frappe* then assumed the threat of immediate, massive retaliation against Soviet cities if Warsaw Pact troops set foot across the West German border.

Next to the United States and successors to the Soviet Union, France's nuclear arsenal has the widest spectrum of weapons for both strategic and tactical use. But that is changing. Modernizations taking place will reduce the variety and increase the aggressiveness. It is possible that the land leg of France's strategic nuclear triad may be abandoned. Nuclear spending declined from US$5.34 billion in 1990 to US$3.7 billion in 1994, then rose slightly to US$3.9 billion requested for 1995.

France became a party to the NPT on 3 August 1992. In early 1994 France conducted the first defense review in over 20 years. Its report (white paper) recommended that France restructure its armed forces to fight several small engagements of long duration relatively far from home. Six strategic scenarios considered include a major war in western Europe. Others ranged from international peacekeeping to protecting overseas territories and former colonies.

The white paper recommended that French armed forces be reorganized to address four major missions: **crisis prevention** (prepositioned forces, intelligence activities, spying sensors), **nuclear deterrence** (the SSBN force with improved and secure communication, plus a second nuclear component for diversification), **protection of national territory** (air defense and ballistic missile defense, as budget allows), and **military action** (military units with secure satellite communication and computerized command to conduct continuous and combined operations day or night).

France's military budget for 1994 was US$41.2 billion, or 3.3 percent of the gross domestic product. Requested military spending for 1995 is US$43.7 billion. France is the only major NATO member that is increasing its military budget. Weapons procurement alone (both nuclear and conventional) has planned increases of 0.5 percent annually during 1995-2000, and is expected to total US$107 billion during that six-year period.

A. FRANCE'S STRATEGIC NUCLEAR TRIAD

France, like the US, operates a triad to deliver strategic nuclear weapons by land, air, and sea. These strategic weapons could reach the former Soviet Union.

1. S-3D Land-Based Missiles.

A force of 18 S-3D intermediate-range ballistic missiles (IRBMs) -- each equipped with a single, one-megaton TN-60 warhead -- make up the land-base leg of the triad. They are deployed in fixed silos located at St. Christol Air Force Base on the Albion Plateau in southeastern France. The complex also contains two underground command posts. These two-stage, solid-propellant missiles became operational in 1980. They have a range of 1,890 nautical miles (3,500 kilometers). The accuracy is not known. The S-3D must be retired by 2003. It is likely that they will not be replaced.

2. Mirage-4P/Mirage-2000N Bombers with ASMP Missiles.

The air wing of the triad is comprised of land-based Mirage-4P bombers and Mirage-2000N strike aircraft.

a. Mirage-4P Bombers. Fifteen of these aircraft are deployed with another 13 in storage. Half are at Mont-de-Marson and the remainder at Cazaux. They have an unrefueled range of 500 nautical miles (930 kilometers) with speeds up to Mach 2.2 -- and can carry one Air-Sol Moyenne Portee (ASMP) missile.

b. Mirage-2000N strike aircraft. Plans are for 75 of these aircraft -- 30 at Luxeuil near the German-Swiss border and 45 at Istres near Marseille. Using drop tanks the Mirage-2000N can fly 970 nautical miles (1,800 kilometers) with terrain following sensors for low-altitude penetration. Their top speed is Mach 2.2. Currently only 45 Mirage-2000Ns are deployed in the nuclear role. Each aircraft can carry one ASMP missile.

c. Air-Sol Moyenne Portee (ASMP) missile. The ASMP, an air-to-surface medium-range cruise missile, delivers a 200-kiloton bomb over a standoff range of up to 160 nautical miles (300 kilometers). It uses a liquid-fuel ramjet engine with an integrated solid propellant booster rocket to reach speeds of Mach 2/Mach 3. Two warheads are used -- the TN-80 with Mirage-4P bombers, and the TN-81 with Mirage-2000N and Super Entendard strike fighters.

3. Submarines and Their Missiles.

France started building its *Le Redoubtable* class nuclear-powered, ballistic-missile submarines (SSBNs) during the 1960s. US President John Kennedy offered to sell Polaris missiles to France, as he did to Britain, but French President Charles de Gaulle preferred to make his own. The lead ship, *Le Redoubtable*, became operational in December 1971. (By that time the United States had commissioned all 41 of its Polaris submarines, and was in the process of converting 31 of them to carry the new-generation Poseidon SLBMs.) Four more of the *Le Redoubtable* class followed -- *Le Tonnant*, *L'Indomptable*, *Le Terrible*, and *Le Foundroyant*. *L'Inflexible*, lead ship of a new class, brought the total to six. *Le Redoubtable* was retired at the end of 1991 so the total is presently five. The minimum number of submarines always at sea has been reduced from three to two.

The SSBN fleet is based at Brest and commanded from Houilles. They patrol in the Atlantic Ocean and the Norwegian and Mediterranean Seas. But they can fire from their home port and hit targets in Russia.

a. M-4 SLBMs.

The French Navy has 80 SLBMs deployed on its five submarines -- each submarine holds 16 of the three-stage M-4 SLBMs.

The M-4A SLBMs are fitted on the *L'Inflexible* and each carries six 150 kiloton MIRVed TN-70 warheads. Their range is 2,370-2,700 nautical miles (4,400-5,000 kilometers).

The M-4B SLBMs have been refitted on the four *Le Redoubtable* class submarines. They each carry six 150 kiloton MIRVed TN-71 warheads for a range of 2,700-3,240 nautical miles (5,000-6,000 kilometers).

b. M-45 SLBMs.

A version of the M-4 SLBM, designated M-45, started going into service, probably late in 1992. It uses the first and second stage from M-4 but has new electronics and reentry vehicles. It will probably carry six TN-75 MIRVed warheads for a range of 3,240 nautical miles (6,000 kilometers. It is scheduled to enter service in 1995 and will be on the entire French SLBM fleet by early in the next century.

B. FRANCE'S TACTICAL NUCLEAR WEAPONS

French tactical nuclear forces are composed of Hades short-range ballistic missiles (SRBMs) and ASMP missiles delivered by aircraft.

1. Hades SRBM.

The planned replacement for now-retired Pluton missiles were 120 slightly-longer-range Hades SRBMs, which would be mobile on the roads. But with the end of the Cold War that program was cancelled and the 30 missiles already produced are stored at Luneville. Hades was designed to carry the TN-90 warhead.

2. Super Etendard Strike Aircraft with ASMP Missiles.

ASMP missiles were described under strategic weapons above. 38 Super Etendard strike aircraft (plus 60 in storage) can each carry one ASMP missile. They are based on the aircraft carriers *Clemenceau* (R98) and *Foch* (R99), which are home-ported at Toulon. Super Entendards have an unrefueled range of 810 nautical miles (1,500 kilometers) and fly at subsonic speeds. Only 20 Super Entendards are currently equipped to carry nuclear weapons.

C. FRANCE'S NUCLEAR MODERNIZATION PLANS

Like Britain, France's nuclear modernization plans address two types of missiles -- one launched from submarines and the other from airplanes. Unlike Britain, the SLBM can also be configured as an IRBM from land-based launchers.

1. M-5 SLBM/S-5 IRBM.

The M-5 SLBM is expected to enter into service around 2005. It will be able to carry twelve MIRVed TN-76 warheads which may have maneuvering and stealth characteristics. A more likely load, however, is 6 warheads. Its range could be as great as 5,900 nautical miles (11,000 kilometers). The development program for the M-5 is estimated to cost US$6.54 billion.

A land-based counterpart of the M-5, called the S-5, could be announced in 1995. It is assumed that the same launch tube would be used for both -- one in a submarine and the other in a silo or mobile launcher. However, it is also likely that new land-based missiles will not be pursued.

2. Le Triomphant *Class SSBNs.*

Four new missile-launching submarines are under construction. The lead ship, *Le Triomphant* is to be operational in 1995. The second is named *Le Temeraire*. They will displace 14,000 metric tons and will carry 16 missiles each. Initially they will be loaded with M-45 missiles fitted with improved penetration aids and lighter warheads. After the turn of the century, probably around 2005, they will start being backfitted with the new M-5 SLBM. Development and production of the four new submarines equipped with M-45 missiles is estimated at US$19.58 billion. All SSBNs except these four new ones will likely be retired shortly after the turn of the century.

3. Air-Sol Longue Portee (ASLP).

This is an air-to-surface long-range cruise missile with speeds up to Mach 3.5 to replace the ASMP. It increases the standoff range to 540-700 nautical miles (1,000-1300 kilometers). ASLP guidance will also be improved, it will have stealth characteristics to avoid detection by radar, and it will be maneuverable to evade interceptor missiles. Initial deployment is projected for 2005. Development costs are estimated at $5 Billion. Originally this was planned as a joint program with Britain. It put France in a financial bind when Britain cancelled out in late 1993.

4. Charles de Gaulle *Class Aircraft Carriers.*

The Charles de Gaulle is planned for operation in mid-1999. Decision to build a second carrier of this class at a cost of US$1.71 billion may be forthcoming in 1997. They will replace the *Clemenceau* and the *Foch.* Initially these new carriers will carry Super Entendards with ASMP as part of their compliment, but these will later be replaced with Rafale aircraft carrying ASLPs.

5. Rafale Strike Fighter.

Two versions are planned -- original numbers were 250 Rafale-C for the Air Force and 86 Rafale-M for the Navy. Some will be fitted with ASMP missiles but later backfitted with ASLP. First deliveries are expected in 1998 to replace the Navy crusader F-8Es. The Navy's Super Entendards will start being replaced in 2004, and Air Force deliveries will follow.

6. Palen Nuclear Test Simulation.

France is developing a computer simulation of nuclear testing (as is the US) which will make it unnecessary to conduct actual nuclear explosions to develop a new warhead. The name of this program is Palen. However, a few more nuclear tests are required to calibrate the computer model.

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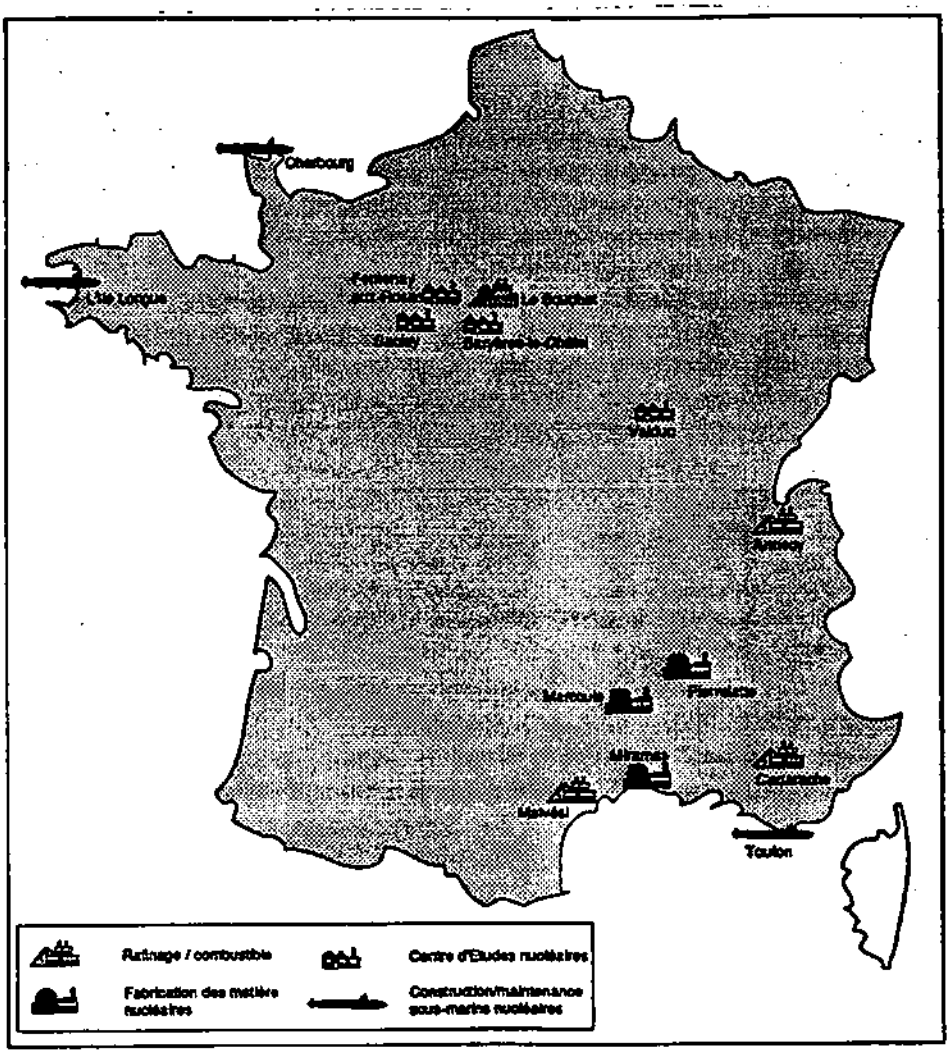

The principal French sites engaged in research on and manufacture of nuclear weapons

FIGURE 7.3-1
FRENCH NUCLEAR SITES
Source: *Damocles in Brief*

7.4 NUCLEAR WEAPONS OF THE CIS

After the collapse of the Soviet Union, 11 of the 15 former republics formed the Commonwealth of Independent States (CIS). These newly-independent countries inherited the Soviet nuclear arsenal. Having a broad spectrum of strategic and tactical nuclear weapons, the inventory of the former USSR is not easy to define. And the location of these scattered weapons is even more difficult to determine. This chapter will be an attempt to give some idea of the situation which now exists in the CIS.

FIGURE 7.4-1
COMMONWEALTH OF INDEPENDENT STATES (CIS)
(Georgia is not a member of the CIS)
Source: *SJMN*

A. CIS STRATEGIC NUCLEAR WEAPONS

Like the US and France, the Soviets assembled a strategic triad of nuclear weapons launched from land, air and sea. The land leg was the strongest. Four of the CIS states inherited the strategic weapons -- Russia, Ukraine, Belarus (formerly Byelorussia), and Kazakhstan. Figure 7.4-2 depicts the distribution of strategic nuclear delivery vehicles (SNDVs) and warheads (w/h's) at the time the USSR broke up. They total to something like 2,402 SNDVs carrying some 10,053 warheads. Keep in mind that these are only deployed warheads. There are more bombs in the stockpile than are deployed.

FIGURE 7.4-2

DISTRIBUTION OF DEPLOYED SNDVs AND W/Hs IN THE CIS (JUNE 1992)

(Warheads Shown In Parentheses)

SNDV	QTY.IN RUSSIA	QTY. IN UKRAINE	QTY. IN BELARUS	QTY. IN KAZAKHSTAN	TOTAL EACH SNDV
SS-11 ICBM	280 (280)				280 (280)
SS-13 ICBM	40 (40)				40 (40)
SS-17 ICBM	40 (160)				40 (160)
SS-18 ICBM	204 (2040)			104 (1040)	308 (3080)
SS-19 ICBM	170 (1020)	130 (780)			300 (1800)
SS-24 ICBM	46 (460)	46 (460)			92 (920)
SS-25 ICBM	268 (268)		72 (72)		340 (340)
ICBM SUB-TOTAL	1048 (4268)	176 (1240)	72 (72)	104 (1040)	1400 (6620)
BLACKJACK BOMBER		20 (160)			20 (160)
BEAR B/G BOMBER	89 (89)				89 (89)
BEAR H BOMBER	7 (56)	14 (112)		40 (320)	61 (488)
BOMBER SUB-TOTAL	96 (145)	34 (272)		40 (320)	170 (737)
SS-N-6 SLBM	96 (96)				96 (96)
SS-N-8 SLBM	280 (280)				280 (280)
SS-N-18 SLBM	224 (672)				224 (672)
SS-N-20 SLBM	120 (1200)				120 (1200)
SS-N-23 SLBM	112 (448)				112 (448)
SLBM SUB-TOTAL	832 (2696)				832 (2696)
GRAND TOTAL	1976 (7109)	210 (1512)	72 (72)	144 (1360)	2402 (10053)

Source: *The Military Balance 1992-1993* for quantities, along with various other articles for distribution.

1. Land-Based ICBMs.

This section will be a more detailed description of each ICBM based in the CIS. As of June 1992, it had some 1,400 ICBMs carrying about 6,620 warheads. The SS-24 ICBM was replacing SS-17s, and the SS-25 was replacing SS-11s and SS-13s. Both of these new ICBMs were designed to be mobile (rail for the SS-24 and road for the SS-25) but many may have been deployed in fixed silos. Specifications for each type follow.

SS-11 Sego, Mods 2 & 3 ICBM

RANGE (nm):	7,000 (Mod 2); 5,700 (Mod 3)
NO. DEPLOYED:	280
RVs/MISSILE:	1 (Mod 2); 3 MRVs (Mod 3)
YIELD/RV (mt):	1.0 (Mod 2); 0.3 x 3 (Mod 3)
CEP (nm):	0.75 (Mod 2), 0.59 (Mod 3)
FUEL:	Liquid
IOC:	1973 (Mod 2); 1975 (Mod 3)

SS-13 Savage, Mod 2 ICBM

RANGE (nm):	5,000
NO. DEPLOYED:	40
RVs/MISSILE:	1
YIELD/RV (mt):	0.6
CEP (nm):	1.0
FUEL:	3 stage solid
LAUNCH:	Hot
IOC:	1968

SS-17 Spanker, Mods 3 & 4 ICBM

RANGE (nm):	5,400 (Mod 3)
NO. DEPLOYED:	40
RVs/MISSILE:	4 MIRVs
YIELD/RV (mt):	0.5 (Mod 3)
CEP (nm):	0.2 (Mod 3)
FUEL:	2 stage liquid
LAUNCH:	Cold
IOC:	1982 (Mod 3)

SS-18 Satan, Mod 4 ICBM

RANGE (nm):	5,900
NO. DEPLOYED:	308
RVs/MISSILE:	10 MIRVs
YIELD/RV (mt):	0.5
CEP (nm):	0.14
FUEL:	2 stage liquid
LAUNCH:	Cold
IOC:	1982

SS-19 Stiletto, Mod 3 ICBM

RANGE (nm):	5,400
NO. DEPLOYED:	300
RVs/MISSILE:	6 MIRVs
YIELD/RV (mt):	0.55
CEP (nm):	0.16
FUEL:	2 stage liquid
LAUNCH:	Hot
IOC:	1982

SS-24 Scalpel, Mods 1 & 2 ICBM

RANGE (nm):	5,400
NO. DEPLOYED:	56 in silos & 36 mobile
RVs/MISSILE:	10
YIELD/RV (mt):	0.1
CEP (nm):	0.1
FUEL:	Solid
LAUNCH:	Cold
IOC:	1987

SS-25 Sickle ICBM

RANGE (nm):	5,670
NO. DEPLOYED:	340
RVs/MISSILE:	1.0
YIELD/RV (mt):	0.75
CEP (nm):	0.1
FUEL:	Solid
LAUNCH:	Cold
IOC:	1985

2. *Intercontinental Bombers.*

Only two bombers left from the USSR are classified strategic because they are the only two with intercontinental range. Details on the bombers follow. For convenience, missiles and bombs will be described under tactical weapons.

TU-160 Blackjack Strategic Bomber.

RANGE (nm):	3,930
NO. DEPLOYED:	20
WEAPONS LOAD:	12 AS-15 ALCMs/24 AS-16 ALCMs
IOC:	1988
SPEED:	Mach 2.3
COMMENTS:	4 turbofan engines.

TU-95 Bear B/G Strategic Bomber.

RANGE (nm):	3,450
NO. DEPLOYED:	89
WEAPONS LOAD:	2 AS-4 ASMs/4 bombs
IOC:	1956
SPEED:	Mach 0.8
COMMENTS:	4 turbofan engines.

Tu-95 Bear H Strategic Bomber.

RANGE (nm):	3,720
NO. DEPLOYED:	61
WEAPONS LOAD:	10 AS-15 ALCMs,
IOC:	1984
SPEED:	Mach 0.8
COMMENTS:	4 turbofan engines.

3. *Submarines and SLBMs.*

This section will be a more detailed description of each SLBM based in the CIS. As of June 1992, the CIS had 55 strategic submarines loaded with 832 SLBMs carrying a total of some 2,696 warheads. All of these submarines are controlled by Russia. Before the USSR broke up, the SS-N-20 SLBM on Typhoon submarines and the SS-N-23 SLBM on Delta-4 submarines were replacing SS-N-6 SLBMs on Yankee-1 submarines. Specifications for each type follow.

SS-N-6 Serb, Mods 1, 2 & 3 SLBM	
RANGE (nm):	1,300 (Mod-1); 1,600 (Mod-3)
NO. DEPLOYED:	96
RVs/MISSILE:	1 (Mod 1); 2 mrvs (Mod-3)
YIELD/RV (mt):	1.0 (Mod 1); 0.5 x 2 (Mod-3)
CEP (nm):	0.7
FUEL:	2 stage liquid
IOC:	1968 (Mod-1); 1974 (Mod-3)
DEPLOYMENT:	On 6 Yankee-1 submarines
COMMENT:	16 missiles per Yankee-1.
SS-N-8 Sawfly, Mods 1 & 2 SLBM	
RANGE (nm):	4,200 (Mod-1); 4,900 (Mod-2)
NO. DEPLOYED:	280
RVs/MISSILE:	1
YIELD/RV (mt):	0.8 (Mod-1); 0.8 (Mod-2)
CEP (nm):	0.8 (Mod-1); 0.5 (Mod-2)
FUEL:	2 stage liquid
IOC:	1972 (Mod-1); 1973 (Mod-2)
DEPLOYMENT:	On 18 Delta-1 and 4 Delta-2 submarines
COMMENT:	12 missiles per Delta-1, 16 missiles per Delta-2.
SS-N-18 Stingray SLBM	
RANGE (nm):	3,500 (Mods-1/3); 4,300 (Mod-2)
NO. DEPLOYED:	224
RVs/MISSILE:	3 MIRVs (Mods-1/3); 1 (Mod-2);
YIELD/RV (mt):	0.02 (Mods-1); 0.45 (Mod-2); 0.1 (Mod-3)
CEP (nm):	0.75 (Mod-1); 0.5 (Mods-2/3)
FUEL:	2 stage liquid
IOC:	1977 (Mods-1/2); 1978 Mod-3)
DEPLOYMENT:	On 14 Delta-3 submarines
COMMENT:	16 missiles per Delta-3.
SS-N-20 Sturgeon SLBM	
RANGE (nm):	4,500
NO. DEPLOYED:	120
RVs/MISSILE:	10 MIRVs
YIELD/RV (mt):	0.1
CEP (nm):	0.25
FUEL:	Three stage solid
IOC:	1981
DEPLOYMENT:	On 6 Typhoon submarines
COMMENT:	20 missiles per Typhoon. Stellar inertial guidance (SIG) for midcourse and terminal updates.
SS-N-23 Skiff SLBM	
RANGE (nm):	4,500
NO. DEPLOYED:	112
RVs/MISSILE:	4 MIRVs
YIELD/RV (mt):	0.1
CEP (nm):	0.5
FUEL:	Three stage liquid
IOC:	1985
DEPLOYMENT:	On 7 Delta-4 submarines.
COMMENT:	16 missiles per Delta-4.

B. CIS TACTICAL NUCLEAR WEAPONS

Location of the tactical nuclear weapons the CIS inherited are harder for an observer to determine. Naval tactical nuclear weapons were distributed among three former republics. Ground-force nuclear weapons were found in nine CIS states. And air-defense nuclear weapons were scattered among 12 former Soviet republics. All in all, some 3,000 of the CIS's tactical nuclear bombs lie outside Russia.

CIS leaders agreed to move all tactical nuclear weapons to Russia. Reports indicate that all theater nuclear weapons were moved to Russia by July 1992.

It will be assumed that weapons removal mandated by the INF Treaty has been completed, so land-based INF weapons will not be included.

Following is a listing of Russian tactical nuclear weapons as best they can be determined.

1. Air-to-Surface Missiles (ASMs).

AS-4 Kitchen ASM

NO. DEPLOYED:	1,000 estimated
IOC:	1962
YIELD:	1 megaton
RANGE (nm):	160
SPEED:	Mach 3.3
DEPLOYMENT:	Tu-22 Blinder, Tu-95 Bear-G, and Tu-26 Backfire.
PROPULSION:	Single stage liquid rocket.

AS-6 Kingfish ASM

NO. DEPLOYED:	820 estimated.
IOC:	1977
YIELD:	350 kilotons to 1 megaton
RANGE (nm):	160
SPEED:	Mach 3.0
DEPLOYMENT:	Tu-16 Badger
PROPULSION:	Single stage liquid rocket.

AS-15 Kent ALCM

NO. DEPLOYED:	300+ estimated
IOC:	1984
YIELD:	250 kilotons
RANGE (nm):	900
SPEED:	Mach 0.6
DEPLOYMENT:	Tu-95 Bear H, Tu-160 Blackjack, Tu-22M Backfire.
PROPULSION:	Turbojet

AS-16 Kickback ASM

NO. DEPLOYED:	Unknown
IOC:	1989
YIELD:	350 kilotons
RANGE (nm):	110
SPEED:	Unknown
DEPLOYMENT:	Unknown
PROPULSION:	Unknown

2. Anti-Ballistic Missiles (ABMs).

SH-08 Gazelle ABM

NO. DEPLOYED:	SH-08 + SH-11 = 100
IOC	1984
WARHEAD:	10 kiloton
RANGE:	Endo-atmospheric
DEPLOYMENT:	In silos around Moscow.
COMMENTS:	High acceleration/supersonic.

SH-11 Modified Galosh ABM	
NO DEPLOYED:	SH-08 + SH-11 = 100
IOC	1983
WARHEAD:	Nuclear
RANGE:	Exo-atmospheric
DEPLOYMENT:	In silos around Moscow.

3. *Anti-Aircraft Missiles.*

SA-5 Gammon SAM	
NO DEPLOYED:	1,800
IOC	1967
WARHEAD:	Dual capable
RANGE (nm):	160
SA-10 Grumble SAM	
NO. DEPLOYED:	2,400
IOC	1981
WARHEAD:	Dual capable
RANGE (nm):	55

4. *Surface-to-Surface Missiles (SSMs).*

FROG-7 Luna SRBM	
RANGE (nm):	40
NO. DEPLOYED:	300
YIELD:	200 kilotons
CEP (nm):	0.22
IOC:	1965
DEPLOYMENT:	Modernized wheel transporter.
PROPULSION:	Single stage rocket.
SS-1C Scud-D SRBM	
RANGE (nm):	160
NO. DEPLOYED:	300
YIELD:	Kiloton range, dual capable
CEP (nm):	0.25
IOC:	1965
DEPLOYMENT:	Mobile
PROPULSION:	Two stage liquid rocket.
SS-21 Scarab SRBM	
RANGE (nm):	65
NO. DEPLOYED:	300
YIELD:	100 kilotons
CEP (nm):	0.16
IOC:	1978
DEPLOYMENT:	Mobile
PROPULSION:	Two stage solid rocket.
SSC-1B Sepal GLCM	
RANGE (nm):	250
NO. DEPLOYED:	40
YIELD:	350 kilotons
CEP	Unknown
IOC:	1962
DEPLOYMENT:	40 transporter/erector launchers
PROPULSION:	2 solid boosters, 1 air breathing sustainer.
COMMENTS:	Coast defense, nuclear doubtful

SS-N-3A/B Shaddock SLCM

RANGE (nm):	240
NO. DEPLOYED:	60
YIELD:	350 kilotons
IOC:	1962
DEPLOYMENT:	Echo-2 and Juliet submarines. Kynda and Kresta ships.
PROPULSION:	Cruise missile engine. Mach 0.9-1.4
COMMENTS:	Sub must surface to launch. Requires aircraft or satellite for midcourse guidance.

SS-N-7 Starbright SSM

RANGE (nm):	30
NO. DEPLOYED:	56 launchers
YIELD:	200 kilotons
IOC:	1968
DEPLOYMENT:	7 nuclear-powered submarines.
PROPULSION:	Single stage solid rocket.
COMMENTS:	Radar homing.

SS-N-9 Siren SSM

RANGE (nm):	60
NO. DEPLOYED:	256
YIELD:	200 kilotons
IOC:	1968/9
DEPLOYMENT:	5 submarines, 36 corvettes,
PROPULSION:	Single stage solid rocket Mach 1.4
COMMENTS:	Terminal infra red radar.

SS-N-12 Sandbox SSM

RANGE (nm):	300
NO. DEPLOYED:	164
YIELD:	350 kilotons
IOC:	1973
DEPLOYMENT:	4 carriers, 3 cruisers, 13 submarines.
PROPULSION:	Mach 2.5
COMMENTS:	Submarine must surface to launch. Aircraft/satellite guidance assist.

SS-N-19 Shipwreck SLCM

RANGE (nm):	300
NO. DEPLOYED:	288
YIELD:	500 kilotons
IOC:	1980
DEPLOYMENT:	9 submarines, 3 cruisers, 1 carrier
PROPULSION:	Supersonic
COMMENTS:	Anti-ship missile.

SS-N-21 Sampson SLCM

RANGE (nm):	1,620
NO. DEPLOYED:	104
YIELD:	200 kiloton
CEP	0.1
IOC:	1987
DEPLOYMENT:	14 submarines (Yankee-1, Akula, Sierra, and Mike).
PROPULSION:	Subsonic
COMMENTS:	Long-range, land-attack. Can be fired from submarine torpedo tubes.

SS-N-22 Sunburn SSM

RANGE (nm):	215
NO. DEPLOYED:	200
YIELD:	200 kilotons
IOC:	1981
DEPLOYMENT:	15 destroyers, 20 corvettes.
PROPULSION:	Unknown
COMMENTS:	Possibly an SS-N-9 improvement.

SS-NX-24 Sunburn SSM

RANGE (nm):	unknown
NO. DEPLOYED:	12
YIELD:	unknown
IOC:	None
DEPLOYMENT:	None
PROPULSION:	Unknown
COMMENTS:	In trials on submarine.

5. *Artillery and Mortars.*

152mm (6") Artillery Pieces

RANGE (nm):	10-15
NO. DEPLOYED:	2,100
YIELD:	2-5 kilotons, dual capable
IOC:	1955, 1972, 1978, 1980

203mm (8") Artillery Pieces

RANGE (nm):	10
NO. DEPLOYED:	240
YIELD:	2-5 kilotons, dual capable
IOC:	1975

240mm (9.45") Mortars

RANGE (nm):	7
NO. DEPLOYED:	120
YIELD:	Probably 1-5 kilotons, dual capable
IOC:	1975

6. *Anti-Submarine Warfare (ASW) Weapons.*

SS-N-14 Silex ASW Missile (ASROC type)

RANGE (nm):	30
NO. DEPLOYED:	306
YIELD:	1-5 kilotons
IOC:	1974
DEPLOYMENT:	26 cruisers, 32 frigates.
PROPULSION:	Unknown
COMMENTS:	Autopilot command override with acoustic homing torpedo.

SS-N-15 Starfish ASW Missile (SUBROC type)

RANGE (nm):	25
NO. DEPLOYED:	396 estimated
YIELD:	5 kilotons approximately
IOC:	1982
DEPLOYMENT:	35 submarines
PROPULSION:	Unknown
COMMENTS:	Launched from torpedo tube, reloadable.

SUW-N-1 (FRAS-1) ASW Missile (ASROC type)

RANGE (nm):	16
NO. DEPLOYED:	8
YIELD:	5 kilotons
IOC:	1975
DEPLOYMENT:	2 carriers, 2 cruisers
PROPULSION:	Unknown

Type 53-68 Heavyweight Torpedo

RANGE:	8
NO. DEPLOYED:	Unknown
YIELD:	20 kiloton
IOC:	1970
DEPLOYMENT:	Useable from all 533 mm torpedo tubes.

Type 65 Heavyweight Torpedo

RANGE:	27
NO. DEPLOYED:	Unknown
YIELD:	20 kiloton
IOC:	1981
DEPLOYMENT:	Useable from all 650 mm torpedo tubes.

Mines

NO. DEPLOYED:	Unknown
YIELD:	5-20 kiloton
IOC:	Unknown
COMMENT:	May be anti-ship as well as anti-submarine.

Depth Charges

NO. DEPLOYED:	Unknown
YIELD:	Unknown
IOC:	Unknown
COMMENT:	Known to exist, no details.

7. *Gravity Bombs.*

Strategic Bombs

NO. DEPLOYED:	Unknown
YIELD:	5, 20 & 50 megatons.

Tactical Bombs

NO. DEPLOYED:	Unknown
YIELD:	250 & 350 kilotons

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ratification will be exchanged and the treaty will go into effect. Reductions must then take place within seven years.

Friction between Russia and Ukraine seems to spark the main threat to START. Because of concerns about Russia, the Ukranian legislature may not have enough votes to ratify the treaty. On 30 September 1992 the Ukrainian prime minister resigned and was succeeded by Leonid Kuchma. One month later Kuchma announced that Ukraine was unwilling to destroy its missile silos and turn the weapons over to Russia -- "As for the strategic weapons, we cannot give them up," he said. [*SJMN*, 1 November 1992, p. 7A] Kuchma said his country wanted to use the uranium in the weapons for nuclear power plants, and that destroying the silos would damage large areas of farmland. Ukraine leaders have shown interest in joining a defense alliance like NATO, or receiving a commitment from the US to insure Ukraine's security.

In a move to save the START Treaty, the US offered in November 1992 to pay the $100-150 million cost of destroying Ukranian nuclear weapons if that country ratifies the START Treaty. Senate Armed Services Committee Chairman Sam Nunn, after meeting with Ukranian President Leonid Kravchuk, said he believed the latter would stick to the plan of making Ukraine a nuclear-free state.

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7.5 NUCLEAR WEAPONS OF CHINA

The Peoples Republic of China (PRC) does not have a large number of nuclear delivery vehicles. What they do have seem to be classed either strategic or INF.

A. PRC STRATEGIC NUCLEAR WEAPONS

China operates strategic nuclear forces delivered by land and sea, and possibly by air.

1. *Land-Based Missiles.*

The land-based leg of the PRC strategic forces is composed of CSS-3 and CSS-4 ICBMs.

a. **CSS-3 ICBMs.** The liquid-fueled CSS-3 ICBMs are four-stage missiles with inertial guidance. Their range is 4,350 nautical miles (8,000 kilometers) with a single 3-megaton warhead. They are based in caves and rolled out prior to launching. Twenty have been deployed since 1980.

b. **CSS-4 ICBMs.** The liquid-fueled CSS-4 ICBMs are four-stage missiles with inertial guidance. They are silo-based. Their range is 6,200 nautical miles (11,490 kilometers) with a single 5-megaton warhead. They have been tested with MIRVs. Four have been deployed since 1981..

2. *Sea-Based Missiles.*

The PRC's sea-based strategic missiles are carried on one Xia-class, nuclear-powered submarine commissioned in 1988. Possibly a second SSBN of an improved class has also entered service. They each carry twelve CSS-N-3 missiles. China's SSBN construction has been proceeding extremely slowly because of problems with submarine reactor design and solid rocket fuel for the missiles. Some sources say that China plans as many as 12 SSBNs. [*Japan Times*, 27 December 1993]

a. **CSS-N-3 SLBMs.** The solid-fueled CSS-N-3 SLBMs are submarine-launched and have a range of 1,450 nautical miles (2,587 kilometers) with a single 250-kiloton warhead. An improved, solid-fuel SLBM with longer range may be deployed in the late 1990s.

3. Hong-7 Bombers.

A strategic Hong-7 bomber first flew in 1988 and they could be starting deployment in 1994.

B. PRC TACTICAL NUCLEAR WEAPONS

Tactical missiles of the PRC are launched from land, although it is possible that some could be launched at sea or from aircraft.

1. Land-Based Weapons.

The land-based missiles are the CSS-2 and CSS-6 IRBMs, classified as INF weapons.

a. CSS-2 IRBMs. The liquid-fueled CSS-2 IRBMs have an inertial guidance system and a range of 1,550 nautical miles (2,872 kilometers) with a single 2-megaton warhead. They are rolled out from a cave before being launched. Fifty have been deployed since 1971.

b. CSS-6 IRBMs. The solid-fueled CSS-6 IRBMs have an inertial guidance system and a range of 970 nautical miles (1,800 kilometers) with a single 250-kiloton warhead. They are mobile. Thirty six have been deployed since 1986.

2. Sea-Based Weapons.

There is one Soviet-built *Golf* submarine which the PRC Navy acquired in the 1960s. It can carry three missiles but the type is not known. This vessel may only be used for ICBM sea trials.

3. Hong-6 Bombers.

Up to 120 medium-range (1,670 nautical miles or 3,100 kilometers) Hong-6 bombers are deployed. They could carry two or three nuclear bombs.

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7.6 PROLIFERATION OF NUCLEAR WEAPONS

Now that the US and CIS seem to be taking steps to implement Article 6 of the NPT -- the "good faith clause" in which Washington and Moscow promised to negotiate an end to their arms race -- some aspiring nuclear states may feel less threatened. Others, however, have their own reasons for obtaining "the bomb."

Aspiring nuclear powers are usually competitively opposed to other aspiring nuclear powers, which is their excuse for being aspiring nuclear powers in the first place. These dangerous ideological-political-geographical confrontations could spark a nuclear war. Such countries are not deterred by any sophisticated nuclear arsenal -- superpower or otherwise.

To understand nuclear technology, it would be helpful to know that uranium bombs are the easiest to build although they are large, heavy and expensive. They are so simple they are guaranteed to work without testing. Many scientifically immature countries such as Iraq, Pakistan and South Africa were able to construct uranium bombs. China's first bomb was uranium. A large supply of uranium bombs also appear in the former Soviet Union's arsenal. Plutonium bombs, on the other hand, are more difficult to build, but once the technique is mastered the bomb can be better tailored for many needs, and they are cheaper. Plutonium bombs can be miniaturized in size and tuned to lower yields. It is interesting to note that all bombs except one that are currently in the US arsenal have a plutonium primary. That one exception is the W-33 warhead for 8-inch artillery, and a recent GAO report states that all of them have now been removed from the stockpile and disassembled. [GAO/RCED-94-9, p. 16] With that information in mind it is easier to understand the various nuances of nuclear weapons proliferation.

A. THE MID-EAST

One of the most volatile spots in the world is the Mid-East. Not only is Israel squared off against some nationalistic Arab nations, but fundamentalist Muslim states threaten their secular muslim counterparts.

1. Israel.

Israel has not signed the NPT so there is no legal restriction on that country's nuclear activities. Its nuclear program dates back to the late 1940s, from as long as Israel has existed. As early as 1947 it was discovered that recoverable traces of uranium existed in the Negev Desert.

Much of the information below is paraphrased from Seymour Hersh's *The Samson Option*, an excellent history of how the Israelis developed their nuclear arsenal and how the US was bribed and blackmailed to look the other way.

a. **Israel's Nuclear Beginning.** Israel's Atomic Energy Commission was established in 1952, under the military and unknown to the public. In 1955, under the Eisenhower's "Atoms for Peace" program, the Israelis obtained a small research reactor. It was installed at Nahal Soreq, south of Tel Aviv. But it was too small to produce enough plutonium for a bomb and too closely monitored for bomb-making activities to take place.

France and Israel agreed in 1953 to help each other in nuclear research. France was then striving to become a nuclear power. Israeli scientists worked closely with the French in designing the French bomb. They helped France build its elaborate reprocessing plant for plutonium. They also showed France a means they developed to make heavy water and better ways to mine uranium.

In return the French, starting in early 1958, helped Israel build its Dimona complex in the Negev Desert. France supplied an EL_{102} reactor and helped construct a reprocessing facility buried 40 meters (130 feet) below the surface. U-2 spy planes monitored this activity but the US did nothing to stop it.

Israeli scientists were trained at French plants and observed the first French nuclear explosion in February 1960. Later, Israel constructed a nuclear weapons assembly plant at Haifa, to the north, and heavily-fortified nuclear storage bunkers at its Tel Nof fighter base near Rehovot. Since there was so much internal opposition to an Israeli bomb, most of the work was accomplished by private funding from Jews living abroad.

b. **The Yom Kippur War.** By 1973 Israel had at least 20 nuclear weapons. Three or more missile launchers had been operationalized at Hirbat Zachariah and there were some mobile Jericho-1 missiles. A squadron of nuclear-capable F-4 fighter aircraft was in underground bunkers at Tel Nof Air Force Base near Rehovot. Data from US KH-11 spy satellites was shared with the Israelis and helped them to target their weapons. According to Seymour Hersh, US policy toward this amassing of Israeli nuclear weapons was "a conscious policy of ignoring reality." [Hersh, p. 319]

Egypt and Syria launched a surprise attack against Israel on 6 October 1973 -- on Yom Kippur, the most sacred day on the Jewish calendar. It took Israel three days to fully mobilize. On October 8th Israel called its first nuclear alert. All completed nuclear missile launchers at Hirbat Zachariah were armed. Eight of the special F-4s at Tel Nof Air Force Base were put on 24-hour alert. Initial targets included the Syrian and Egyptian military headquarters. Israel blackmailed the US for conventional arms replacement rather than escalate to nuclear.

At this time Dimona had mastered the miniaturization of nuclear bombs to fit into 175-mm and 203-mm artillery shells. After the Yom Kippur war, Israel formed at least three battalions of nuclear-capable artillery. Each battalion eventually contained a dozen 175-mm artillery pieces with three nuclear shells apiece. The 203-mm pieces were later introduced.

c. **The South African Connection.** On Saturday, 22 September 1979, a US Vela satellite passing over the southern Indian Ocean picked up the double-flash of a nuclear explosion. At least two Israeli naval ships had sailed to that area previously. Israeli experts as well as South African scientists observed what is believed to be the third test of a low-yield nuclear artillery shell for the Israeli Defense Force. According to Seymour Hersh, Israel "signed an agreement before the 1979 test calling for the sale to South Africa of technology and equipment needed for the manufacture of low-yield 175-mm and 203-mm nuclear artillery shells." [Hersh, p. 276]

d. **The Sixth Nuclear Power.** Mordical Vannunu exposed the Israeli nuclear program in a 5 October 1986 London *Sunday Times* article, complete with photographs. Vannunu, a nuclear technician for nine years at the Dimona plant, indicated that Israel was producing about ten nuclear weapons a year, and had already stockpiled possibly 200.

Vannunu was kidnapped in Rome and taken back to Israel to stand trial for "collection and delivery of secret information, with the intent to impair the security of the state, and acts calculated to assist an enemy in war against Israel." [Farinella] He was convicted and sentenced to 18 years in prison. Vannunu stated before his abduction that, although he broke Israeli law, his was an act of conscience intended to serve the interests of Israeli democracy and world peace by bringing public knowledge and debate to bear on Israel's entry into the nuclear weapons club. Israel has never attempted to impeach Vannunu's integrity.

e. **Israel's Present Nuclear Arsenal.** Israel has steadily progressed as a nuclear-weapons state. Nuclear land mines were put in place in the Golan heights during the early 1980s. By the mid-1980s Dimona had made hundreds of low-yield neutron bombs. In September 1988 Israel put its first satellite into orbit as a step toward gathering its own intelligence. Israel can also produce lithium deuteride for thermonuclear hydrogen weapons and is negotiating for a waiver from US laws and international agreements so it can obtain extremely powerful computer technology. Israeli scientists are working at the cutting edge of nuclear technology and are involved with intensive research into the next generation of weaponry.

A Russian intelligence report asserts that Israel also has a store of chemical weapons. "At the present time Israel is capable of producing toxic substances of all types, including nerve-paralyzing, blister-producing and temporarily-incapacitating substances," said the report. [*AW&ST*, 8 November 1993, p. 29]

f. **Israel's Delivery Systems.** Israel is also improving the delivery systems for nuclear warheads. Air delivery could be made by a number of aircraft, including US-furnished fighters -- 112 F-4E, 51 F-15, and 145 F-16 aircraft. Another 25 longer-range and more-modern F-15I fighters are on order. These newer versions will be able to reach Iran and Libya. Even the F-15s sold to Saudi Arabia do not have the sophisticated radar and other systems that the F-15Is have.

Missiles for nuclear delivery are some 50 Jericho-1 SRBMs (250 nautical miles range), 50 Jericho-2 IRBMs (800 nautical miles range), and over 100 US-furnished Lance missiles (62 nautical miles range). Some analysts believe the Lance missiles are in storage and that Jericho-1 missiles are being retired since Jericho-2s started becoming operational in 1989. During the 1991 war against Iraq, Israel moved mobile nuclear missile launchers into positions to target Iraq. A full-scale nuclear alert lasted for weeks.

2. Iraq.

Iraq is an Islamic Arab nation with a secular government under the firm control of Saddam Hussein. The orthodox Sunni (Sunnite) Muslims are slightly outnumbered by fundamentalist Shia (Shiite) Muslims. The latter, along with the Kurdish population, are kept repressed to prevent a fundamentalist upheaval of government, as happened in Iran. Saddam Hussein has encouraged a fierce Arab nationalism to (1) oppose Israel's expulsion of Palestinian Arabs in order to create a Jewish home state (Zionism), (2) to repress Iran's efforts to convert Iraq to a fundamentalist Muslim state, and (3) to win the centuries-old feud with Persian Iran over control of the Shatt-al-Arab River which is now Iraq's only access to the sea since the British carved Kuwait from Iraq. This is a simplified description but it illustrates the many facets which motivate Iraq to become more powerful.

a. The Futile Grasp for a Plutonium Bomb. In December 1959 ten Iraqi students started a four-year nuclear-physics course in Moscow. A year later an agreement was signed for the Soviet government to construct a small IRT-2000 research reactor at Tuwaitha, about twelve miles southeast of Baghdad. In the meantime, gifted Iraqi students were also enrolling in Western universities to study nuclear science. The Soviet 2-megawatt reactor was completed on 6 January 1968 and was eventually upgraded to 5-megawatts. But that was still too slow for a crash nuclear program and Soviet surveillance made the accumulation of plutonium from such a program impossible.

In 1969 Iraq ratified the NPT, making its nuclear activities subject to International Atomic Energy Agency (IAEA) inspections. This made Iraq look less-ominous in its pursuit of the atom. Saddam knew that he need only give three months notice to withdraw from the treaty after the reactor and high-grade uranium fuel had been obtained.

Following the 1967 Arab-Israeli Six-Day War it became obvious that Israel was fast approaching a nuclear capability. This put new urgency behind Iraq's program. France was the most receptive to Iraq's courtship, with oil as a dowry. In December 1974 French Premier Jacques Chirac accepted then Vice President Saddam's invitation to Baghdad. There followed a series of closely-guarded secret negotiations in which Saddam got everything he wanted. The Osiris material-test reactor -- named after the ancient Egyptian god of hell and death -- surfaced as the only one available with the capacity for plutonium production suitable for an atomic bomb program. Construction began near Tuwaitha after the final agreement was signed in August 1976. Completion of this dual reactor, called Osirak, was slated for 1981. [For a well-written description of how this program evolved, and the secrecy surrounding it, see Nakdimon in the bibliography.]

Immediately after the deal with France was finalized, Saddam started negotiations with Italy to obtain "hot cell" laboratories for extract weapons-grade plutonium. They played an important function in allowing Iraq to accommodate IAEA inspections. With several weeks notice, Iraq could move all evidence of bomb-making from the reactor site to the hot cell laboratory. By some quirk, such laboratories escaped inspection requirements.

In a surprise attack on 7 June 1981, using 14 US-made F-15 and F-16 aircraft, Israel bombed the nearly-complete Osirak reactor. Israel contended that the French-supplied plant was to produce atomic bombs for use against Israel. Many nations denounced this act but took no stronger measures against Israel, a US ally. The UN Security Council added its condemnation on June 19th. After the attack Saddam dispersed his nuclear-research facilities throughout the country and fortified them.

Destruction of the Osirak reactor set Iraq back. It appears that Osirak was never rebuilt. According to a LLNL scientist, Iraqi weapons scientists began giving more attention to developing the technology for extracting weapons-grade Uranium-235 from Iraq's natural uranium supply, and from what had already been stockpiled for reactor fuel. [DeWitt, p. 6]

b. Iraq's Helpers. The *Washington Post* reported on 5 May 1989 that the US Commerce Department had stopped an Iraq-bound shipment from CVC Products, Inc. of Rochester, New York of vacuum tubes which could be used in the production of nuclear fuel. CONSARC, a New Jersey company, wanted to ship high-temperature furnaces to Iraq to melt the zirconium used to clad nuclear fuel rods, but the White House stopped it. US and British officials in late-March 1990 broke up a smuggling ring by which Iraq could obtain US-made electronic devices to trigger nuclear bombs. A British company, Euromac, Inc. with offices just outside London, was involved. Euromac in September 1988 had contacted CSI Technologies, Inc. of San Marcos, California about purchasing custom-made capacitors. CSI became wary when the specifications were exactly as required for atom bomb triggers, and informed customs officials.

According to the *Financial Times*, Euromac is part of a wide network of shadowy front companies in Europe set up for the purpose of obtaining sensitive Western technology for Iraq's various nuclear/chemical/biological programs. This network was supposed to have been funded by $1 billion of the $2.867 billion in unauthorized loans to Iraq by the Atlanta, Georgia branch of Banca Nationale de Lavoro (BNL -- Italy's largest state-owned bank).

Hewlett Packard in 1985-86 sold computers to a German company but allegedly knew the ultimate destination was Iraq. Hewlett Packard also sold some computer equipment directly to Iraq. Tektronix of Beaverton, Oregon, sold graphics design terminals and other equipment to Iraq.

Iraq also owns part interest in a Swiss company which is suspected of having shipped to Baghdad parts which can be used for processing nuclear materials. At least four locations are pursuing plutonium extraction and/or uranium enrichment. Iraq is a striking example that ratifying the NPT and agreeing to international inspections is not assurance that the country is not seeking the nuclear bomb.

c. **Iraq's Delivery Systems**. During the 1980s when Iraq was at war with Iran, French aircraft were sold to Baghdad. In February 1981 the first four of 60 Mirage fighter-bombers were delivered. In June 1983, France agreed to sell Super Entendard jet bombers to Iraq. Five Super Entendards arrived the following October. These aircraft could deliver nuclear bombs. But missiles are also in the works.

Scud missiles, with a range of 160 nautical miles, were supplied by Moscow. These could likewise be mounted on trucks. In mid-August 1989 an explosion leveled a secret Iraqi military plant at Hilla, about 60 miles south of Baghdad. The British *Independent* reported that the plant was engaged in research to extend the range of Iraq's missiles. Iraq was receiving sensitive missile technology information from West Germany, France and Italy through a sly network of European front companies. With this help, Iraq increased the Scud missile's range to 270 nautical miles, enough to reach any capital city in the Mid-East.

A US House of Representatives panel was told during September 1989 that Egypt had ended participation with Iraq and Argentina in the effort to build a medium-range missile based on Argentina's Condor-2, and that Iraq had intentions of fitting it with nuclear or chemical warheads. Although it would have a range of 750 miles, accuracy is only claimed at 250 miles or less. Two American rocket scientists were sentenced to prison on 5 December 1989 for conspiring to smuggle sensitive information to Egypt which would help the Condor-2 missile program with Iraq.

Technology and Development Group (TDG) near London, an Iraqi front company, through its subsidiary, Matrix Churchill in Coventry north of London, received a $16 million loan commitment from BNL to supply precision lathes and other equipment to support Iraq's Condor-2 missile program. Due to US bureaucratic bungling the letters of credit were not stopped.

On 7 December 1989, Iraq announced that two days earlier it had launched a three-stage, 48-ton rocket which could put a satellite into orbit, making it the first Arab country capable of such a feat. This missile, named *Tammuz*, was launched from a space research center in Anbar province, west of Baghdad, and could also be used as a long-range ballistic missile. Iraq claimed it had developed two new surface-to-surface missiles with a range of 1,240 miles.

In April 1990, Saddam threatened to wipe out half of Israel with chemical weapons if it tried another attack on Iraqi facilities. According to the *New York Times* on 29 March 1990, Iraq had for the first time built fixed launchers for its missiles within ranges of the capitals of Israel (Tel Aviv) and Syria (Damascus).

In mid-1990 there was a request to ship a US supercomputer to a Brazilian team helping Iraq with its ballistic-missile program, and which could also be used in Iraq's nuclear program.

Lindberg Heat Treating Company of Chicago in September 1990 had Commerce Department approval to ship seven rocket motor case sections to Brazil, although Brazil was still helping on Iraq's missile program.

Contributing to the accuracy of Iraq's missiles, including the extended-range versions of the Soviet-supplied Scud missiles, were imaging enhancement systems to analyze satellite photos and determine targets, obtained from International Imaging Systems of Milpitas, California. The company admits furnishing such systems, purportedly for civilian use, in 1981 and 1987.

d. **Iraq Today**. Since the 1991 Persian Gulf war, Saddam Hussein has played a cat and mouse game with IAEA inspectors attempting to make certain that Iraq is not pursuing a nuclear capability. But in 1993 his attitude seemed to change as the embargo against Iraqi oil, started to take its toll. In April of that year Saddam agreed that the last of its weapons-grade uranium could be removed by the United Nations. In November Iraq agreed to allow UN monitoring of its industries on a long-term basis to assure it isn't developing weapons of mass destruction. Immediately after that agreement, Saddam called for a lifting of the oil embargo. Perhaps the UN Security Council will do that if a third of the revenues earned go toward paying Iraq's war debts and the other two-thirds is used for humanitarian purposes. But Saddam will first have to demonstrate his sincerity, and that may take time.

3. Iran.

Iran is a Persian nation with a fundamentalist (Shiite) Muslim government. It has tried to spread its fundamentalist politics, especially in Iraq. Iran and Iraq have for decades battled over their border region and access to the Persian Gulf. Since the Iranian revolution Iraq, with a secular government of hegemonistic ambitions, has been resisting the spread of Muslim fundamentalism. The two nations fought a long war during the 1980s, primarily over that issue. Becoming a nuclear state will greatly aggravate relations with Iraq. And more, it will irritate Pakistan to the east which is believed to already possess nuclear bombs.

a. **Iran's Nuclear Quest**. Iran has been working through a huge network of foreign suppliers in its nuclear program. In early 1992 the US was able to block Iran's purchase of a large research reactor from China and a nuclear fuel reprocessing plant from Argentina -- a suspicious combination. But in 1993 Russia and China agreed to supply Iran with two nuclear reactors each. In late 1993 Iran was negotiating with the Czech Republic regarding nuclear technology, ostensibly for peaceful purposes. Iran has pledged to submit to international safeguards, but since IAEA inspections are scheduled in advance evidence of bomb making could be transferred to a reprocessing plant prior to the visit.

In March 1992, when former Soviet battlefield nuclear weapons were being transferred to Russia, there were unconfirmed media reports that two or three tactical weapons may be missing in Kazakhstan. During the following October, an Associated Press dispatch said that Iran had finalized a deal with Kazakhstan in July to buy four nuclear warheads. Of course the parties concerned denied the allegations, but the source had provided accurate information in the past.

Nevertheless, it is feared that Iran will produce a nuclear bomb by the end of the 1990s. Iran ratified the NPT in 1970, one year after Iraq, but could easily withdraw on short notice. As Iraq and North Korea have demonstrated, being a signatory to the NPT legitimizes and even facilitates the production of nuclear weapons material. Iran already has a stockpile of chemical weapons.

b. **Acquiring the Delivery System**. For delivery vehicles Iran has received modern Backfire bombers from Russia, with a combat radius of over 2,000 nautical miles, as well as some 20 Su-24 Fencer deep strike aircraft. In March 1994 Iran was negotiating with China to buy Jian Hong-7 fighter bombers. These aircraft can fly long-range precision attack day or night in all weather.

In 1991 North Korea sold several dozen 300-mile-range Scud-B missiles to Iran, and another shipment destined for Syria may have been diverted to Iran. Iran also wants to buy North Korea's longer-range Rodong-1 missiles which could reach Israel. So far North Korea has resisted that sale, but may be holding out for trade in oil.

Iran has also fielded cruise missiles accurate enough to threaten US naval forces. Russia and Ukraine are becoming more willing to sell missile technology prohibited by the Missile Technology Control Regime which bans the sale of missiles with greater than 190 miles range. [*AW&ST*, 1 March 1993, p. 25]

Iran's missile technology has been slowed recently because it lacks skilled workers, science-intensive technology, scarce materials, and sufficient funding. In mid-1993 the US asked the European Union (formerly European Community) to curtail trade with Iran to prevent the sale of weapons. Belgium, Luxembourg, Britain, France, Germany, Greece, Netherlands, Spain, and Italy had all done significant business with Iran. Denmark, Ireland and Portugal had done so on a smaller scale. Nevertheless, there is no sign that Iran is being prevented from pursuing a buildup of both conventional armaments and weapons of mass destruction.

4. Nuclear Delivery Capability.

Several Mid-East countries have recently obtained ballistic missiles and aircraft which could be used to deliver nuclear, chemical or biological warheads. These countries may not be actively pursuing the nuclear bomb but if Iraq or Iran obtain nuclear weapons the picture could change.

a. **Saudi Arabia**. It became known in March 1988 that Saudi Arabia had obtained from China the CSS-2 IRBMs (also known as the DF-3) which have an inertial guidance system and a range of 1,550 nautical miles. These are now the longest-range ballistic missiles in the Mid-East. Saudi Arabia has also assembled a large inventory of F-15 fighter aircraft from the US, which can deliver weapons of mass destruction. Another $9-billion deal is pending for an additional 72 F-15 fighters. Saudi Arabia is not a party to the NPT.

b. **Syria**. Syria is also acquiring ballistic missiles which could deliver weapons of mass destruction -- nuclear, chemical or biological. It has purchased Scud missiles from North Korea and has tested one. Syria ratified the NPT in 1969. Syria is one of 26 nations on the list of countries involved in international drug trade, and cannot receive US aid or US support for World Bank loans.

B. INDIA AND PAKISTAN

India and Pakistan have had strained relations since the 1948 partitioning of India, when Pakistan was established. Disputes have had ethnic-religious overtones but the bottom line is borders and territory -- especially in the Kashmir region. Enmity was heightened in 1971 when India stepped in with military force to help the liberation of Bangladesh (formerly East Pakistan).

Now the competition has turned to a nuclear standoff. In May of 1990 India and Pakistan faced off on the verge of a nuclear exchange. The crisis was defused by the Bush administration but kept from Congress and the American public because of high-tech sales to Pakistan. [See Hersh, "On The Nuclear Edge."] The next time they go to war over the Kashmir, it might very well be nuclear.

1. India.

During border clashes with China in 1962, India fared poorly. When China conducted its first nuclear test in 1994, the balance of military force shifted unmistakenly in China's favor. India decided that an accelerated nuclear program was justified. Although Pakistan was a hostile threat at that time, it was China that first motivated India's nuclear program.

a. **India's Bomb Program.** India purchased a nuclear reactor from Canada, and thus provided a case example of how a civilian nuclear power program can divert spent reactor fuel to a chemical reprocessing plant to make a nuclear weapon. The first Indian nuclear test was ordered in 1973, and that country exploded a 12-kiloton atom bomb underground at Pokaran in the Rajasthan Desert on 18 May 1974. It was advertised as a peaceful use for nuclear explosives -- a futile attempt to stimulate water resources -- but it served notice to both China and Pakistan that India had the bomb. India than ostensibly abandoned its nuclear weapons program but threatened to restart it if Pakistan appears near to developing such weapons.

Nevertheless, India's nuclear technology reached the point in 1985 where it could produce plutonium at domestic sites free from outside inspection. By 1985 it had tons of plutonium stored without IAEA safeguards. India has not signed the NPT because it exempts from controls those countries already possessing the bomb. This plutonium storage caused international concern regarding illicit sales or acquisition by terrorists.

Pressure continued to mount in parliament for India to resume its nuclear bomb program. Then in 1985 the New Delhi government announced that its new reactor near Bombay could produce weapons-grade plutonium -- possibly enough for ten bombs. "This is a landmark in the country's atomic energy program," said then Chairman Raja Ramanna of India's Atomic Energy Commission. [*SJMN,* 9 August 1992, p. 18A]

India's current nuclear capability is as follows:

-- The Cirus and Dhruva reactors can theoretically produce more than 30 kilograms of weapons-grade plutonium per year; enough for four fission bombs. Other civilian reactors also produce plutonium.

-- It was estimated in mid-1992 that India's stockpile of weapons-grade plutonium exceeded 300 kilograms; enough for forty or fifty atom bombs.

-- Uranium enrichment has also begun at two gas centrifuge plants but the capacity is still very low.

-- Research work at Bhabha Atomic Research Centre appears to be addressing fission for thermonuclear (hydrogen) bombs.

b. **India's Delivery Systems.** To compliment its nuclear program, India has also amassed the means of delivering weapons of mass destruction. It has tested the Agni intermediate-range ballistic missile (IRBM) that will carry a one-ton warhead 2,500 kilometers (1,350 nautical miles). The Agni can reach targets in China, Saudi Arabia, and Iran, as well as Pakistan. On 23 May 1989 the two-stage Agni missile was launched from the new Balasore Test Center in eastern India. It was apparently a failure. A second test was conducted three years later, on 29 May 1992. The third (second successful) test was conducted against a sea-based target in the Bay of Bengal on 19 February 1994. West German cooperation in India's space program is suspected to have helped develop this missile. The launches are interpreted as a sign that India intends to assert its military dominance in the region.

India also has a tactical short-range ballistic missile (SRBM) called Prithvi which is nuclear-capable and can reach out for 250 kilometers (135 nautical miles) with a one-ton payload. It a highly-mobile, single-stage weapon with an accuracy of 250 meters (820 feet). The tenth test of Prithvi took place on 7 February 1993.

Besides missiles, the Indian Air Force also has both Soviet- and French-made aircraft capable of delivering nuclear bombs. They include Jaguar-IS strike aircraft along with Mirage-2000 and MiG-29 fighters.

Other events are causing concern for India. China is embarked on an ambitious military modernization program, including the purchase of modern fighter planes from Russia. Military cooperation between Pakistan and China was signaled when China allegedly sold Pakistan road-mobile M-11 missiles capable of carrying a nuclear warhead for 185 miles. And a 23 March 1994 report from India's defense ministry called for a complete reassessment of the regional threat because the quantity and sophistication of arms being acquired by Pakistan are beyond legitimate defense needs. The report also warned against the sale of F-16 fighter planes to Pakistan by the US.

2. Pakistan.

Pakistan is another country with civilian nuclear reactors and a bomb program. Zulfikar Ali Bhutto launched Pakistan's nuclear weapons program in 1972, thereby creating another action-reaction cycle with India. After India exploded its bomb in 1974, the Pakistani leader said his people would eat grass before they let the Indians get ahead. Pakistan is not a signatory to the NPT.

a. **Pakistan's Bomb Program.** The 1973 oil "crisis" sparked a flow in cash in the Mid-East and countries such as Libya were willing to finance Pakistan's endeavor. Rising oil prices also created a boom in nuclear power stations, and enterprising countries started a uranium shortage scare to promote plutonium reprocessing plants. The extracted plutonium could be used for power plant fuel or for bombs. Pakistan ordered such a plant from France in 1975. In 1977 the US confronted France with evidence of Pakistan's intent and the sale was quietly cancelled.

Meanwhile, Pakistani scientists working at the Netherlands' Urenco plant -- a British-Dutch-German consortium -- stole plans for the gas-centrifuge enrichment of uranium. Pakistan then built a similar facility at Kahuta, about 12 miles southeast of Islamabad. Pakistan then engaged in a clandestine program of obtaining critical equipment from abroad. When it became evident that Pakistan was producing weapons-grade uranium, the US Carter administration cut off aid in 1979, but the levels of aid were too small to have much effect. When the US needed Pakistani help in getting weapons and supplies to Soviet-occupied Afghanistan, Congress in 1981 passed a $3.2 billion economic and military assistance package for Pakistan. The rules were changed that aid would be cancelled if Pakistan developed a nuclear bomb. In effect, the US had turned its back on developing such weapons. By 1984 the Kahuta plant was operating.

In late 1986, US President Ronald Reagan certified to Congress that Pakistan did not have nuclear weapons. There is evidence, however that Pakistan was well along the way toward achieving that goal. A leaked Defense Intelligence Agency report that same year said Pakistan detonated its second high-explosive test during September 1986 as part of its continuing effort to develop an implosion trigger for a fission bomb. Intelligence reports also showed that Pakistan had enriched plutonium above the 90 percent needed for a bomb.

Although Pakistan's main effort so far appears to be on the simpler uranium bombs, it apparently has not given up on graduating to the higher technology of plutonium devices. On 31 December 1991, China announced that it was selling Pakistan a 300-megawatt nuclear reactor but that it would be subject to safeguards and inspection by the IAEA. But Pakistani Foreign Secretary Shahryar Khan said on 6 February 1992 that his country has the components and expertise to assemble a nuclear bomb -- the first time an official had publicly revealed the status of Pakistan's nuclear program.

Retired Pakistani Army Chief of Staff Mirza Aslam Beg revealed in July 1993 that his country's first successful nuclear test was conducted in 1987. Pakistan's industrial enriching plant now has the capacity to produce enough highly-enriched uranium to make 12 nuclear bombs a year. With the Iranian threat from the west as well as friction with India over the Kashmir to the east, there is no motivation for Pakistan's to slow its bomb-making effort.

b. **Pakistan's Delivery Systems.** Pakistan tested a ballistic missile on 25 April 1988 in its southern Thar Desert. The missile had the range to reach Bombay or New Delhi in India. It was designed by Pakistan but with help from the Chinese. Pakistan tested two more short-range missiles in January 1989.

In early May 1993, US officials alluded to reports and other indications that China might be shipping road-mobile M-11 SRBMs with spare parts to Pakistan. China rebutted that it was not violating its promise to stop selling delivery systems for mass destruction.

In October 1990, US President Bush could not certify that Pakistan does not have an atomic bomb. Some $564 million in new military and economic aid was cancelled along with $2.7 billion in previously-authorized military aid and sales, including 71 F-16 fighter jets. But that cancellation did not occur before the US provided its staunch ally during the Afghanistan war with $4 billion in aid, including delivery of 40 F-16 fighters which make excellent nuclear delivery vehicles. Pakistan also has French-supplied Mirage aircraft.

3. *The Indian-Pakistani Standoff Today.*

On New Year's Day 1992, India and Pakistan exchanged lists of nuclear facilities under a mutual agreement not to strike each other's installations. In January 1994, talks between India and Pakistan regarding the Kashmir collapsed. India then submitted proposals to keep the peace -- including maintaining tranquility along the line of control dividing Kashmir where troops clashed in October 1993, disengagement of troops from the disputed Siachen glacier, and a pact of "no first use" of nuclear weapons. To punctuate its proposal, India in February tested its Agni IRBM.

The US government is now seeking a waiver from Congress in order to sell 38 aircraft to Pakistan for $700-million. In return the Pakistani's are asked to promise not to make any more fissionable material. This is part of a larger effort by the Clinton administration to ease the crisis over the Kashmir. It does not appear that Pakistan is too willing to make such a pledge.

On 7 April 1994, Deputy Secretary of State Strobe Talbott opened talks in New Delhi. His attempt to defuse tensions met a cool response. Pakistani Prime Minister Benazir Bhutto said she would never curtail her country's peaceful nuclear program if India were not made to do the same. India's foreign and finance ministers all but ruled out a two-nation agreement with Pakistan to verifiably end fissionable material production. They said a broader-based accord is needed.

The unsuccessful talks broke off on 8 April 1994. The situation is still critical. The nuclear threat prevails.

C. EAST ASIA

East Asia is also an area of nuclear competition with several facets. North Korea is still at odds with South Korea and its alliance with the US and Japan. Japan fears the North Korean nuclear potential and South Korea fears that potential from both North Korea and Japan. Many in Japan also want the nuclear capability because of world status and to help become a permanent member of the United Nations Security Council. Meanwhile Taiwan still bitterly contends for recognition as the legitimate Chinese government.

1. Japan.

On 4 January 1993 the Japanese freighter *Akatsuki Maru* completed its 2-month voyage carrying 3,300 pounds of plutonium oxide from France to Japan -- the first of a total 50 metric tons to be transported to Japan as fuel for its experimental breeder reactor. This plutonium was originally furnished to Japan by a 1988 Implementing Agreement approving its use and shipment for 30 years. Because it has already given 30 years of prior approval, Congress cannot modify or disapprove shipments on a case-by-case basis -- its oversight powers are diminished. Under Annex 5 of that agreement, the US administration approved the shipment in September 1992. The 15,000-mile voyage commenced on 16 November 1992. Opponents to the shipment cited hijacking by terrorist groups as one of the dangers. Besides being fuel for Japan's planned series of breeder reactors, this reprocessed fuel is a first step toward weapons-grade material. The US halted its breeder reactor program in the 1970s, largely to stop the spread of weapons-grade plutonium. France has also given up on breeder reactors.

a. Japan's Nuclear Materials Programs. Because Japan does not presently have reprocessing facilities of its own, with US approval it entered into agreement with Cogema (a French government-company located at La Hague, France) and British Nuclear Fuels Limited (a government-owned company located at Sellafield, England) to reprocess Japan's spent reactor fuel. Eventually Japan expects to meet its own reprocessing needs at its Tokai and Rokkasho reprocessing facilities, plus a new plant to be built. By 2010 Japans supply of plutonium -- recovered both at home and abroad -- will be 85 metric tons. Shortly after the turn of the century Rokkasho alone will recover 4.5 to 5 metric tons of plutonium a year. [GAO/RCED-93-154, p. 3] Rokkasho also enriches uranium. [Tsuchida, p. 7]

Dr. Atsushi Tsuchida, a Japanese physicist living in Tokyo who specializes in the physics of energy resources and the environment, has written an enlightening paper unmasking the intrigue of Japan's nuclear program. [See Tsuchida, "The Nuclear Arming of Japan" in bibliography] Much of the discourse in this section on Japan will be taken from his paper.

Threat of the Akatsuki Maru being hijacked was overblown because the low-purity plutonium created by normal reactors is not suitable for building bombs. Tsuchida feels the furor was orchestrated by nuclear-weapons proponents in both Japan and the US who would benefit. As stated by the US General Accounting Office, the shipment "raised or revived broader concerns about the growth of plutonium stocks around the world and the increasing risk of nuclear proliferation. [GAO/RCED-93-154, p. 13] With more potential "enemies" it is easier to justify more nuclear weapons.

Tsuchida points out that "even as the world waxed hysterical over the plutonium shipment, the Japanese government was quietly hatching a more ominous scheme: the reprocessing of spent fuel from its own fast breeder reactors to produce 98% pure Pu-239. [This] cannot be justified as a response to the country's chronic energy shortage. Rather, it is a clear step toward the production of tactical nuclear weapons." [Tsuchida, p. 1]. Highly-pure Pu-239 is essential to building nuclear weapons light enough to be delivered.

Japan is building a Recycling Equipment Test Facility at its Tokai nuclear complex which will process the spent blankets from Japan's Jyoyo fast breeder reactor. The Jyoyo reactor was taken out of private utility company hands in late 1992 and also made a government project. The reprocessed plutonium from ordinary reactors is used in the core of a breeder reactor. Around that is a blanket of depleted uranium (U-238). When the core is irradiated, the composition of the blanket becomes 98% weapons grade Pu-239 with only 2% Pu-240 and trace amounts of other contaminants. This process takes about two years. Only the 40 kilogram blanket is to be "recycled" at Tokai, which will produce enough plutonium for 20 tactical nuclear weapons. Soon the new Monju fast breeder reactor will go on line and Japan will be able to produce enough Pu-239 for 20 tactical nuclear weapons a year.

The cycle will then be to reprocess the spent fuel from normal nuclear reactors which will then be used as the core of breeder reactors. Then the blanket from breeder reactors will be processed to make bomb-grade material.

The uranium enrichment facility at Rokkasho has also been stepped up. Besides enriched uranium, another product is the depleted uranium used for the breeder reactor blankets. Activities at Rokkasho are indispensable to Japan's bomb-making ambitions. Rokkasho will also give Japan the option of a plutonium bomb or the simpler uranium bomb which needs no testing.

Japan is also experimenting with two new types of reactor for producing bomb-grade plutonium. One is an advanced pressurized water reactor which is midway between a conventional light water reactor and a breeder reactor. The other is a special light water reactor which uses the depleted uranium blanket.

b. **Nuclear Carrier Vehicles in Japan.** Japan is well along on missile technology. It has space-launch vehicles which could be converted to weapons carriers. Japan has a good handle on missile technology.

Japan also has aircraft which could deliver tactical nuclear bombs. In its air force are some 72 F-4 and 158 F-15 fighter jets.

c. **Japan's Constitution Permits Nuclear Weapons.** Misunderstandings about Japan having a non-nuclear constitution should also be clarified. The constitution does not specifically prohibit nuclear weapons. It bans war-making capabilities in excess of what is needed for national defense. In that light, strategic nuclear weapons would be outlawed but tactical nukes are acceptable. It is true that Japan's Atomic Energy Act allows only peaceful use of nuclear power. But it is a general law with no punitive provisions, so it lacks the teeth to prevent the Japanese military from building tactical nuclear weapons. Then there are the much heralded Three Non-Nuclear Principles which are nothing more than a proclamation and can be changed as circumstances dictate. In summary, there is no legal provision to stop Japan from being a nuclear power. Japan is a party to the NPT, but that can be abrogated on short notice. In addition, the NPT is fast losing its credibility as an instrument to prevent proliferation of nuclear weapons.

On the other hand, there are events that encourage Japan to join the nuclear club. The US has proposed that United Nations Security Council membership be upped from 15 to 20, and that Japan and Germany become permanent members. Although not by written decree, the current five permanent members are the five proclaimed nuclear powers. Membership in that council might give Japan implied authority to become a nuclear weapons state.

Mr. Pluto is a round-faced, rosy-cheeked, animated character created by Japan's nuclear-power industry to defuse public concern over the dangers of plutonium. Featured in a promotional videotape entitled *The Story of Plutonium: That Dependable Fellow, Mr. Pluto,* he promises, "Hey everybody, I'm not a ghost! If everyone treats me with a peaceful and warm heart, I'll never be scary or dangerous." Sporting red boots and a green helmet with the chemical symbol for plutonium on it, the perky and pint-sized Mr. Pluto congratulates a boy for drinking a plutonium-laced soda pop. The narration misleads people by saying that if plutonium were swallowed, most of it would pass through the body. But even the smallest residue of the silvery-gray radioactive material is poisonous to humans.

2. North Korea.

Only an armistice resulted from the Korean war. No peace treaty has ever been signed. Hostilities still exist and it is difficult to sort out truth from propaganda. This section will attempt to meld together the differing views to provide some substance for judgment.

a. Some Historical Background. The Korean war was a major war. There were more bombs dropped there than all the conventional bombs dropped on Japan during World War II. Three to six civilians died for every combatant that was killed. Figures from the South Korean Red Cross show almost a quarter million dead and a similar number wounded, with 303,213 missing. Technically the war still rages while north and south are still divided by a so-called de-militarized zone on the 38th parallel. Vietnam and Germany are now reunited but there are still two Koreas.

Each year the US military carries out joint exercises with South Korean forces in the largest military maneuvers worldwide. Called "Team Spirit," this simulated battle with North Korea practices everything from beachhead landings to nuclear strikes. US nuclear weapons are stationed in South Korea.

North Korea responds by deploying strong invasion forces along the de-militarized zone. This is then used by US and South Korean officials to justify continued maneuvers -- and so the spiral goes.

During the 1980s there had been no indication that North Korea intended to invade the South. On 13 December 1991 the two Koreas signed a non-aggression and reconciliation agreement. They each agreed to "not interfere in the internal affairs of the other" and "refrain from all acts aimed at destroying and overthrowing the other side." Both agreed to "discontinue confrontation and competition" and to cooperate in "joint development of resources," permit "free travel and contacts between citizens" and to "connect several railways and roads." [Cited in Swomley, p. 24] The pact called for de-nuclearization of the Korean Peninsula but the details have yet to be negotiated.

The US removed its nuclear weapons from South Korea in late 1991 and suspended the 1992 "Team Spirit" exercise. North Korea already a party to the NPT, signed the nuclear safeguard accords which permit IAEA inspections of nuclear facilities. In the eight months between 11 May 1992 and 26 January 1993 the IAEA made six inspection team visits to North Korea. That was the situation at the beginning of 1993.

b. **North Korea's Nuclear Program**. North Korea has been pursuing a nuclear program since the 1950s, possibly with China's and the Soviet Union's help. It has been operating a Soviet-supplied research reactor since 1968. The transition to a military program probably took place in the late 1970s.

Since 1980 US spy planes have been monitoring the construction of an unusually large reactor near Yongbyon, about 60 miles north of Pyongyang, which was completed in 1987. The complex now comprises about 100 buildings contains two reactors and a fuel reprocessing plant. The largest reactor was expected to begin operation in late 1992 and produce enough plutonium to construct seven bombs a year. The reprocessing plant would be in operation shortly thereafter. It was expected that North Korea could have its first nuclear bomb in 1994.

North Korea became party to the NPT in 1985, possibly to make it easier to obtain nuclear materials and technology. But it did not fulfill its obligation to sign a safeguards agreement with the IAEA within 18 months, possibly to hide construction of its Yongbyon complex.

After signing the 13 December 1991 non-aggression agreement North Korea still did not allow IAEA inspections immediately. In January 1992 North Korea cited Japan's plutonium program as reason for holding off. In April 1992 the story came out that North Korea was producing weapons-grade plutonium, but the purity of such reprocessed plutonium would make a bomb too heavy for North Korean aircraft, and they had not yet developed a missile. North Korea then signed the nuclear safeguard agreement and inspections began in May.

In early 1993 reports inspired by newly-appointed CIA director R. James Woolsey entered the media that North Korea was secretly developing nuclear weapons. Apparently there were some inconsistencies in the quantity and quality of nuclear material between what North Korea declared and IAEA findings. During its 25 February 1993 meeting the IAEA board, hoping to resolve the inconsistencies, passed a US-sponsored resolution calling for inspection of two nuclear waste sites which had not been declared. North Korea claimed these were secret military facilities with no connection to its nuclear program. "Team Spirit 1993" took place in March, using an extra 19,000 US troops and the aircraft carrier *Independence*.

On 8 March 1993 North Korea reacted by putting all its armed forces on war alert, and on March 12th gave the required three-months notice that it would withdraw from the NPT. The North Korean statement said: "Some officials of the IAEA secretariat insist stubbornly on the 'inspection' of our military bases as dictated by the United States, while ignoring our demand for inspection of the nuclear weapons and nuclear bases of the United States in South Korea." [Cited in Swomley, p. 25] The IAEA Board of Governors reported North Korea's non-compliance to the UN Security Council. On 11 May 1993 the Security Council passed a resolution, with China and Pakistan abstaining, calling upon North Korea to comply with IAEA safeguard agreements.

After successfully testing its Rodong-1 IRBM, North Korea announced on 11 June 1993 that it would stay on as a party to the NPT, at least for now. The remainder of 1993 saw a heated exchange of rhetoric and diplomatic bluffs over North Korea's stance on inspections. There was much talk of sanctions, military exercises, positioning Patriot anti-ballistic missiles in South Korea and Japan, ad infinitum. A December 1993 *Los Angeles Times* poll indicated that 51 percent of Americans favored "using American military force to eliminate ... suspected North Korean nuclear weapons installations" if negotiations to allow inspections fails. [*SJMN*, 10 December 1993, p. 17A] Punctuating this media hey-day were CIA exhortations that North Korea already has one or two nuclear weapons.

When pressure was getting heavy on North Korea during mid-February 1994, it agreed to resume IAEA inspections at the seven declared sites. But it still would not allow inspection of the two disputed waste dumps. When IAEA inspectors wanted to take a closer look at a plutonium-processing area during mid-March, inspections were again called off. That was followed by another threat to pull out of the NPT.

Again a heated diplomatic exchange commenced. Various agencies and groups released reports giving their estimation of North Korean capabilities and intentions. "Team Spirit" exercises, which had been suspended, are being re-evaluated. That is the situation at the time of this writing.

c. **North Korea's Delivery Systems**. North Korea on 29 May 1993 successfully fired an improved Scud missile, dubbed Rodong-1, with a range of 1,000-1,300 kilometers (540-700 nautical miles or 620-808 miles). Fired into the Sea of Japan, the missile only went half its alleged range. Although this event was used to bolster military spending by the US and some of its allies, other military leaders doubt that North Korea has the technical and industrial capability to develop and produce such an IRBM.

North Korea does have Scud-B SRBMs with a range of about 300 miles, and could probably produce 100 of these annually.

d. **What Next?** Since the end of the cold war, and the shift in US policy to emphasize regional wars rather than global, Korea has always been mentioned as a potential future US battleground. We must diligently search out the truth rather than relying on a controlled media if we want to avoid another "enemy" image that merely serves the goals of nuclear and military proponents.

We have heard much in the media about North Korea's nuclear ambitions, and most of it may be true. But that does not mean we should rule out a peaceful solution. Former Commander-in-Chief of US Pacific Forces, retired Admiral Ronald J. Hays, warned that threats, trade sanctions and isolation are not the answer. He said, "This view underestimates the toughness and determination of the Korean people when faced with adversity." He said the best approach "is the opposite of isolation. Offer instead increased contacts, expanded dialogue; reduce the embargo; support the North's objective of establishing free economic and trade zones; and grant diplomatic recognition.... Why not, therefore, fight without weapons a delaying action on nuclear weapons development and strive for an accelerated transition to a friendlier regime with Pyongyang?" The admiral suggested that an approach "coordinated with South Korea, Japan, China and Russia can work, but only with patience, negotiating skills and perseverance." The only alternative, warned the admiral, is "a military ultimatum ... but only if we are prepared for a second war on the Korean Peninsula." [*Honolulu Star Bulletin*; cited in Swomley, p. 25]

3. South Korea.

South Korea should be considered because it not only worries about a North Korean bomb and the Rodong-1 missile, it also worries about Japan. The Korean people have not forgotten Japan's brutal 36-year rule of their country prior to World War II. South Korea is a party to the NPT.

A 21 July 1992 editorial in the *Korean Daily* argued that Japan's plan for a breeder-reactor blanket processing facility, coupled with Japan's shipment of reprocessed plutonium from France, indicated more than just a program for energy resources. Recalling that Japan now participates in UN peacekeeping forces and has requested a permanent seat on the UN Security Council, the editorial continued, "If Japan next acquires the capacity to build nuclear weapons any time it wants, its transition to a political and military superpower will be complete. If this happens, we shudder at the implications for Northeast Asia." [Cited in Tsuchida, p. 5]

South Korea in September 1992 announced it is buying two Canadian CANDU reactors which are capable of producing weapons-grade plutonium. Concern over Japan's plutonium program has now caused the South Korean government to announce in June 1993 that it would counter with its own fast breeder reactor program.

South Korea currently has aircraft that could deliver a nuclear bomb. Its air force operates at least 48 F-16 fighters (with plans for 120) and 96 F-4 fighters. Another 36 F-4s are in storage. The air force also has 142 F-5 fighters with another 16 in storage.

The US stopped South Korea's nuclear weapons program in the late 1970s. But South Korean lawmaker, Rep. Suh Su Jong, chief policy analyst for the ruling Democratic Liberal Party, said South Korea was still working on plans to develop nuclear weapons as late as 1991. The importation of Canadian CANDU reactors shows that the US no longer has the muscle to restrain South Korea's ambitions, if it ever had. For whatever reasons, the US has not blocked the import of the Canadian CANDU reactors as it once did when those same reactors were previously considered.

4. Taiwan.

Since 1969, with the delivery of a large research reactor from Canada, the US has wondered about Taiwan's nuclear intentions. Then in January 1988 Colonel Chang Hsien-yi, one of Taiwan's top nuclear scientists and deputy director of the military's nuclear energy research center at Chungshan Institute of Science and Technology, defected to the US with blueprints revealing Taiwan's nuclear weapons plans. In late March of that same year, the US pressured Taiwan to stop work on a secret plutonium reprocessing plant and to shut down its Canadian-supplied reactor. Taiwan has signed and ratified the NPT (but is not a member of the UN or IAEA) and has protested that its nuclear programs were strictly for civilian use.

In early 1993 the military-controlled Chung Shan Science Institute submitted a proposal to the government for a nuclear reactor. Some scholars believe the military has an interest in the project.

Taiwan also has plans for a fourth nuclear site which was originally to have two 1,000-megawatt reactors. In early 1994, after construction was approved in the face of much opposition, the specifications were revised upward to 1,300 megawatts. This again has touched off much citizen and political opposition. Reason for the increase was to take advantage of the so-called "advanced" pressurized water reactor designs in that megawatt range. It is this type of reactor -- halfway between a conventional reactor and a fast breeder reactor -- that Japan is experimenting with to produce bomb-grade plutonium.

Taiwan currently has F-5 and F-104 fighters. The French Air Force has been training Taiwanese pilots to fly the Mirage-2000 airplane. Taiwan is purchasing 60 Mirage fighter-bombers from France, with delivery in 1995. It is also apparently negotiating with the US to buy 150 F-16 fighters.

The good news is that anti-nuclear consciousness seems to be growing and entering the political arena across party lines. Although the growth is most noticeable around the four nuclear plant sites, there is confidence that it will spread across the nation.

D. AFRICA

Evidence abounds of suspicious activities to become nuclear powers, or possessors of other weapons of mass destruction. There are innumerable reports of unauthorized shipments to these countries that were foiled. One must conclude from the number of unsuccessful attempts that there have been many that were successful. Africa has not been immune from this activity.

1. Algeria.

Algeria is a country experiencing a fundamentalist Muslim upheaval in a campaign of terror aimed at gaining control of government. The Islamic Salvation Front is the main fundamentalist movement. In mid-April 1994, hard-line Prime Minister Redha Malek resigned, not unexpectedly. Malek had been cracking down on radical gunmen. President

Liamine Zeroual favors a dual-track approach of cracking down on terrorist but also trying to negotiate with jailed leaders. Zeroual appointed a 54-year-old technocrat, Mokdad Sifi, as the new prime minister. Sifi had previously been minister of equipment.

China has given extensive help to Algeria in constructing a nuclear reactor in a remote site south of Algiers. Western observers fear this heavily-guarded complex is for producing plutonium for a fission bomb. Algeria is not a party to the NPT.

Algeria has many combat aircraft which could be modified to deliver nuclear weapons. Already configured for ground attack are 30 MiG-17, 17 MiG-23, and 10 Su-24 fighter aircraft. It also has an additional 149 MiG-21/-23/-25 fighters which could be converted to deliver nuclear weapons.

2. Libya.

Libya has taken an aggressive interest in nuclear weapons. It would like to buy a weapon or hire some former Soviet weapons scientists. US officials claim that Libyan leader Moammar Gadhaffi has offered Pakistan billions of dollars for nuclear technology. Libya ratified the NPT in 1975.

Regarding delivery vehicles, Libya is well endowed. It has 40 Soviet-built Frog-7 SRBMs with a range of 40 nautical miles (74 kilometers). Their accuracy is about one-quarter nautical mile (463 meters). Libya also has 80 Scud-B SRBMs with an accuracy of half a nautical mile (925 meters) over a range of 160 nautical miles (296 kilometers).

In the way of aircraft, Libya has 5 Tu-22 "Blinder" bombers. These were once used as a strategic medium bomber for the Soviet union. Libya also has 28 MiG-23, 40 Mirage, and 55 Su-20/-22/-24 fighters configured for attacking ground targets. In addition the Libyan Air Force has 238 other fighters -- 162 MiG-23s, 58 MiG-25s, and 18 Mirage.

3. South Africa.

South Africa has a large supply of natural uranium. It is widely believed that this country has developed centrifuge technology, and possibly even laser technology, to concentrate weapons-grade Uranium-235. Soviet *Cosmos* satellites in mid-1977 detected preparations for an underground nuclear test in South Africa's Kalihari desert. Soviet and US pressure dissuaded the South African government from proceeding with that test.

On 22 September 1979 a US *Vela* satellite (67,000 miles above the earth with nuclear-detection sensors aboard) spotted what looked like a nuclear explosion in the ocean south of Africa. New Zealand's Institute of Nuclear Science later reported a slight increase in radioactive fallout. Although vigorously denied, South Africa was accused of setting off a small nuclear blast. Israel was also suspected of being involved.

The United Nations in 1985 accused the US and other western nations of allowing South Africa to obtain equipment needed to develop nuclear weapons. There have also been allegations that Israel shared nuclear technology with South Africa in exchange for uranium. Israeli cooperation dates back to the 1970s. Of course this covert partnership is hotly denied.

In March 1993 South African President F.W. deKlerk revealed that between the late 1970s and when he became president in 1989, six nuclear bombs had been built. He said those bombs were destroyed in early 1990, the uranium-enrichment plant was decommissioned, and uranium fuel was diluted to below weapons-grade. South Africa signed the NPT in July 1991 and is now adhering completely to treaty requirements.

Later, in mid-1993, South Africa cancelled its RSA-4 space launch vehicle which would provided a ballistic missile capability. That now enables the country to abide by the terms of the Missile Technology Control Regime.

E. SOUTH AMERICA

In South America the fear of a nuclear standoff centers on Brazil and Argentina. Although neither country is party to the NPT, both countries signed Treaty for the Prohibition of Nuclear Weapons in Latin America (also called the Treaty of Tlatelolco) in 1967. But according to Article 13, to become a party to the treaty each country must make arrangements with the IAEA for the application of safeguards. It was not until 13 December 1991 that Argentina and Brazil signed such agreements with the IAEA. Also in 1991 these two countries, along with Cuba, signed a declaration prohibiting the production and use of chemical or biological weapons.

Brazil did have a bomb program. Six months after Fernando Collor de Mello took office as president in March 1990, he learned of a secret atom bomb program that had been going on since 1975. He dismantled the project and had filled with concrete a 1,050-foot-deep hole drilled to test a bomb in the Cachimbo mountain range of the remote central Amazon.

Collor was the first popularly-elected president since the 1964 military coup, but he was suspended from office on 2 October 1992, and subsequently ousted, for alleged corruption. His successor's nuclear policy is not yet known.

F. CONCERNS ABOUT NUCLEAR MATERIALS AND TECHNOLOGY

Worries have been mounting for decades, and were raised to new heights by the breakup of the USSR, about international safeguards over nuclear materials and technology. There appears to be an international black market for these commodities. Following are a few instances that came to public attention.

1. Sweden.

Sweden says it halted its nuclear program in 1957, but its nuclear scientists continued to develop defenses against a nuclear attack. This activity was used to justify the 1985 acknowledgement by Swedish research specialists that an underground plutonium bomb was detonated in 1972. The Swedish embassy in Washington confirmed the nuclear test but Sweden's defense ministry claimed the tests were conventional. Sweden ratified the NPT in 1970.

2. Norwegian Heavy Water.

Norway's Foreign Ministry confirmed in May 1988 that 15 tons of Norwegian heavy water (deuterium oxide) was missing. It was in December 1983 diverted to unknown locations from its intended destination in West Germany. Some speculate that the destination was India. Heavy water is tightly controlled because it simplifies the making of a nuclear bomb. Heavy-water reactors can run on the easily-obtained natural uranium, rather than scarce and tightly-controlled enriched uranium. The plutonium byproduct can then be reprocessed for bomb use. It takes about 20 tons of heavy water to produce enough plutonium for one bomb.

Later in May 1988, Norway was investigating whether another shipment of heavy water destined for Romania may have been diverted to an unknown destination.

3. Former Soviet Nuclear Weapons.

Since the breakup of the Soviet Union, the former USSR's strategic nuclear weapons are distributed among four republics. Some of them are now experiencing ethnic strife, and the control of nuclear weapons in those volatile locations is in doubt.

In addition, with the apparently well-organized and well-financed nuclear black market, there is a global fear that some weapons may fall into the wrong hands. Two former Soviet residents were arrested by German authorities in March 1992 with 2.6 pounds of uranium in their car. They were apprehended after trying to sell the radioactive material for $1.1 million. Bavarian police suspect these two were merely couriers in a larger smuggling ring.

During the following October, a Bavarian customs official said Munich police had arrested seven black-marketeers for smuggling 4.85 pounds of weapons-grade uranium from the CIS. Two days before that, Frankfurt police arrested three people who tried to sell a police informant some radioactive material and a Soviet warhead. During 1992, German police have investigated over 100 cases involving smuggling of nuclear materials -- in 1991 there were 29 cases investigated. Government authorities in Belarus told visiting US senators in November 1991 that on numerous occasions smugglers had been caught trying to take enriched uranium into Poland. They fear other shipments may have gotten through because the border is not secure.

Russia is selling missile guidance technology, rocket engines, and other advanced weapons systems technology to the Peoples Republic of China. At first these sales seemed to be individual systems such as SU-27 fighter jets and missile guidance systems. Now there is concern about a broad spectrum of technology which will give China a leading edge in modern weaponry. The real concern arises if China passes this technology on to aspiring nuclear powers.

In early 1993 the CIA said there were no confirmed cases of nuclear weapons being offered on the black market but there have clearly been attempts to smuggle nuclear materials. Plutonium and uranium give off alpha radiation which can be shielded with aluminum foil. It would be impossible to detect a shipment so packaged with a Geiger counter. So far the smuggling attempts have been of low-grade materials. But as disassembly of weapons proceeds, weapons-grade materials will become more abundant.

The dismantling of former Soviet weapons under the START and INF treaties will generate about 500 tons of highly-enriched uranium and 96 tons of weapons-grade plutonium. To date the most difficult part of making a nuclear bomb has been the enrichment of fissionable materials. As this stockpile becomes abundant the smuggling danger will be magnified -- where will the fissionable material be safely stored and how will it be safeguarded.

The US has pledged to buy the 500 tons of highly-enriched uranium from Russia to prevent its sale to other countries. It will ostensibly be diluted to use as reactor fuel. But bringing it to the US is not necessarily making it safer. Between January 1989 and September 1990, routine DOE security inspections identified more than 2,100 security deficiencies at 39 of its contractor-operated weapons-related facilities. These are only the ones "found" during "routine" inspections.

4. Former Soviet Nuclear Scientists.

There are some 10,000 scientists, engineers and chemists who had been working on Soviet nuclear weapons. They have a wealth of knowledge and experience which is sought in other countries. On 6 December 1992 Russian authorities arrested 36 nuclear experts just as their aircraft was ready to take off for North Korea, where the experts had been hired. The concern is that these experts, and others, may become mercenaries for aspiring nuclear powers in the same manner that German scientists worked for the US and USSR after World War II. Ex-Soviet scientists could fuel another nuclear arms race in some sector of the world, just as their German counterparts did about a half-century ago.

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SECTION 8
PLRC PAPERS

8

PACIFIC LIFE RESEARCH CENTER
631 Kiely Boulevard, Santa Clara, California 95051, USA
408/248-1815 (Voice), 408/985-9716 (Fax)

February 23, 1995

The following papers are available from Pacific Life Research Center. Single copies are free. Send a self-addressed, stamped business envelope (#10), unless another size is indicated. The amount of US postage to be on envelope is specified in brackets after each listing.

PLRC-950223 -- *From Star Wars to Scud Buster: A Background Paper on Ballistic Missile Defense*, 23 February 1995 (32 pages) [$1.01 postage in US, on a 9"x10" envelope]

PLRC-941207 -- *Hegemony in Europe: Part-2 -- The Intracacies of Economic Competition*, 7 December 1994 (15 pages) [55 cents postage in US]

PLRC-941107 -- *Hegemony in Europe: Part-1 -- The Subtleties of Political Competition*, 7 November 1994 (20 pages) [55 cents postage in US]

PLRC-941005 -- *Background Paper on the Extreme Low Frequency (ELF) Submarine Communication System*, Revised 5 October 1994 (14 pages) [55 cents postage in US]

PLRC-940829 -- *What After Bosnia? A Background Paper on the Potential for a Major War in the Balkans*, 29 August 1994 (20 pages) [55 cents postage in US]

PLRC-940814A -- *Korea and Nuclear Weapons: A Background Paper on Easing Tensions on the Korean Peninsula*, Revised 13 December 1994 (4 pages) [32 cents postage in US]

PLRC-940106A -- *The Dark Side of Free Trade: NAFTA, GATT and APEC*, Revised 4 February 1995 (18 pages) [55 cents postage in US]

SECTION 9
NONVIOLENT RESISTANCE AND ALTERNATIVES TO MILITARY FORCE

9

9.1 BUILDING AN EFFECTIVE MOVEMENT: WHERE TO START?

In *Trident Resister's Handbook 1992* I wrote a chapter presenting my thoughts on how a better resistance movement could be organized. There has been some enthusiasm shown for my suggestions so I am repeating the salient points as something to start picking at. There is no doubt in anyone's mind, I believe, that we have to become better in many ways before we achieve even our short-term goal of stopping the Trident weapons system, to say nothing of approaching our ultimate goal of universal peace and justice. So any further suggestions or improvements on these ideas are strongly encouraged. Let us use the insight of all to hammer out a fruitful plan for action and living.

A. FIVE SUGGESTIONS FOR AN EFFICIENT NETWORK

Presidents have for decades tried futilely to make their office a monarchy. Their failure, symbolized by the outcome in Vietnam, has resulted in a modicum of control over our national leaders. Now, quickness and decisiveness have again freed those leaders from constitutional restraints.

We in the peace and justice movement must also adapt to new thinking. Rather than reacting to situations after they occur, we must have contingency plans in place, such as the Pledge of Resistance which in my opinion prevented the invasion of Nicaragua. Instead of nostalgically clinging to yesterday's philosophy, we need to experiment with fresh approaches to changing unjust situations. Toward meeting these goals I see five distinct needs -- unity, communication, systematic research, anticipatory planning, and self improvement.

1. Unity: Standing Strong Together.

As I lay on my bunk during a stay at Elmwood Detention Center, I watched the black youth across the aisle. He was a healthy-looking member of my children's generation. His smile was disarming and his enjoyment of life obvious. Quite often I visualize one of my own children, or grandchildren, in the place of young people I meet. I find that it softens my attitude and helps me to be more understanding. This black youth haunted me. I could visualize him in the various stages of growing up that I saw my own children experience. He must be loved by someone, somewhere. What had caused him to be incarcerated?

I never found out the details but in today's society it is not hard to guess. Perhaps it was car theft, or drugs, or many other actions that desperate people resort to in a society stacked against them. I was in jail for political protest. Possibly he was in there for the same reason but didn't recognize it as such. Perhaps if he and I better understood the motivations behind our respective behavior we would find ourselves not too far apart. Perhaps with better dialogue we could plan together for more effective actions.

This anecdote illustrates not only the lack of understanding, but also the lack of unity in seeking a better way of life. It is a common lament that peace and justice organizations seldom have minorities in their ranks. The main reason is that they have their own critical issues to face. One person can't physically participate in every issue. Neither is it possible to have intricate knowledge of every aspect of peace and justice work, or even to read all the material that peace and justice organizations generate.

What I mean by unity is an understanding of, and solidarity with, other groups. The "think globally and act locally" motto expresses the idea. We in the anti-Trident network are doing what we are called upon to do, and that is good. But, as an extreme case, do we fully understand the parallel effort of, say, street gangs in east San Jose, or Los Angeles, or any other major city? Is it possible for people committed to nonviolence to act in solidarity with such youth when neither we nor they can sort out the motivation behind their violent tactics?

Those are potent thoughts to nibble on. Such unity may be the ultimate goal but a better understanding of attitudes needs to be discovered, to say nothing of feeling the power of nonviolence. In the meantime we can build unity among existing groups -- anti-militarism, environmental, racial-equality, sexual-equality, anti-poverty, morality/ethic-building, indigenous self-determination, and many more. Understanding our common goals and maintaining solidarity in the multiplicity of actions we undertake goes a long way toward empowering all of us.

2. *Systematic Research: Digging Out the Truth.*

Some researchers work well together as a network -- each undertaking the area of their expertise. Too many others are duplicating efforts and even competing for recognition. I envision a more systematic research network where many areas are being studied simultaneously with information flowing back and forth -- more areas in more detail than are now being addressed by peace researchers. Much information from many disciplines is needed. Many researchers would be eager to plug into a well-organized network where they could see their efforts appreciated and better used.

This research network would also have to be flexible. One function would be to address current situations as they unfold so that future events can be predicted. For instance, had the peace and justice movement been more aware of the Pentagon's Air-Land Battle plan of the early 1980s, we would have known better what to expect in the Persian Gulf.

3. *Communication: Key to Planning and Solidarity.*

Communication falls into two general categories. One is to provide detailed information on certain subjects for specific groups to use in planning their resistance activities. The second is to provide the big picture for all factions of the peace and justice movement as well as for public education.

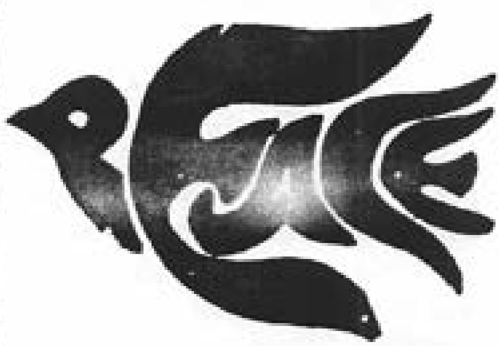
Many publications are addressing the first. Once facts are uncovered by research or other means, they must get out to the action groups in order to serve their usefulness. The *Trident Information Network Newsletter* is a good effort, as are CND publications in Britain. Nukewatch in both countries is doing a magnificent job. So is the *Information Update* prepared by the Pacific Campaign for Disarmament and Security, and *Pacific Bulletin* published by the Nuclear-Free and Independent Pacific Movement, and *BASIC Reports* compiled by the British American Security Information Council, and many more. There are numerous publications providing massive quantities of information to keep their constituency informed. There is too much for the average person to absorb.

What I believe is needed most in the so-called peace press is a publication which would provide a succinct overview of all the issues, and their progress, without deluging the reader with intricate details. It would have to be tightly written and unmercifully edited. This is the organ that would build solidarity among diverse groups and provide the most effective public education. This is the instrument which presents a communication challenge.

4. Anticipatory Planning: Contingencies for All Seasons.

Media columnist Charles Krauthammer outlined three means of military intervention: the "gradualism" of Vietnam, the "passivity" of Beirut, and the "quick and decisive force" of the Gulf war. Military planners have found that the first two just don't move fast enough to be effective. The same is true of peace and justice activities for two reasons: (a) we want to be effective and (b) we have to stay ahead of the opponent.

With forethought and ingenuity we can have a structure in place before a military intervention or other undesirable activity takes place. We of the peace and justice movement were not ready when Desert Shield and Desert Storm broke out. We were thrown off balance by the rapidity of events. We weren't even mobilized before it was all over. No more shall we have the leisure of gradual public education to stop an aggression. Such education must take place before aggression starts. In short, we must call the shots before the military so as to negate its plans.



No, we were not ready for the Gulf war. We have been passive regarding events following the breakup of Yugoslavia. That is still a dangerous area for the wrong kind of involvement. At the time of this writing, US Marines are preparing to enter Somalia to guard relief supplies. How will the military use this opportunity to flex its muscles? Where is the peace and justice movement?

I hesitate to use the words "think tank," but that seems to be the answer here. It is not a new concept for the peace and justice movement. What I visualize are peace strategists who fit together all the researched data and political events to anticipate how the movement will be most effective. This planning would also lay out the parameters for nonviolent, immediate-action plans to meet any potential crises -- so the groundwork can be in place.

Perhaps there should be a layer of these strategizing units. There could be mini-think tanks to advise each specific aspect of resistance, others to formulate plans to meet national emergencies, and still others to conceptualize ideas for inter-group cooperation. The possibilities and advantages seem to be endless.

5. Self Improvement: The Deciding Factor.

Self improvement probably should have been number one because all the above aspects of an effective peace and justice movement hinge on it. We need to overcome our feeling of parochialism toward the particular group we are in, the area of research we pursue, or the publication we help edit -- in short toward all of our personal activities in the Movement. Each person may have had specific feelings while reading the four aspects proposed above. If there was a feeling of enthusiasm and eagerness to participate, that is good. If there was a sensation of your activity or group being diluted, that deserves further examination. The feeling could be a good indication if it leads to a fallacy in what is proposed. But it might be an obstacle if one's status or reputation is perceived to be at stake.

By self-improvement under this aspect I mean, in general, striving to abolish all the attitudes which stand in the way of peace and justice for everyone. I also mean, in particular, all the attitudes which stand in the way of an **effective** peace and justice movement. In the final sense, they are the same.

B. THE CHALLENGE: ARE WE HUMAN ENOUGH?

Trident's real purpose is to protect the first-world lifestyle as that lifestyle exists today. To live so lavishly we buy products produced by corporate entrepreneurship in poorer countries. We then resist any action which threatens our way of living -- and so long as we wear moral blinders we will continue to do so.

We can't drift along blissfully indifferent forever. Catastrophe must be averted and stopping Trident is a good first step. Taking that step hinges on our motivation and courage. Stopping Trident challenges us to transcend material affluence and relate more closely to persecuted people. Stopping Trident will happen when new values guide us and then -- just as liberation came about in Zambia, Poland, the Philippines, Eastern Europe, the Soviet Union, and elsewhere -- western nations will again blossom into true democracies worthy of our pride. Folding our nuclear umbrella will mean living simpler so we can eliminate the deprivation of others, and cease being a market for the profiteers who use that umbrella to devastate poor countries. It will mean recognizing legislative stonewalling, government bellicosity, military propaganda -- and most of all recognizing the manner in which we delude ourselves to justify the status quo. Finally, it will mean standing up to the backlash which will occur when our efforts finally become effective. The question is, are we up to the challenge?

* * * * *

9.2 WHY WE DON'T NEED TRIDENT

This chapter is a hodge podge of information on why we don't need and shouldn't have Trident. Sometimes it is instructive to compile, pro and con, all the arguments which may be used or encountered in a responsible resistance campaign. Such a list allows us to refresh our memory and organize our thoughts. This chapter will be a start toward that compilation. It will be expanded and altered as new information is supplied.

A. TRIDENT CAN NOT BE JUSTIFIED

Trident was designed, from a military viewpoint, to be a powerful, precise, and elusive weapon that would enhance America's dubious prestige as the invincible nuclear power. While advertised as the most stabilizing leg of the strategic nuclear triad because it is mobile at sea and not vulnerable to a first strike, critics have recognized since the early 1970s that it would be the ultimate first-strike weapon. That makes it the most destabilizing strategic weapon because it might motivate an opponent to strike first if America's intentions were misinterpreted during a serious international crisis.

Any perceived military justification for Trident should have disappeared with the Cold War. That did not happen. Information is being twisted to convince the public that Trident is still needed. Trident is not only becoming a strategic monad as the role of ICBMs and bombers fade, it is also entering the picture as a rapid-response weapon in a nuclear expeditionary force.

1. Trident as a Destabilizing First-Strike Weapon.

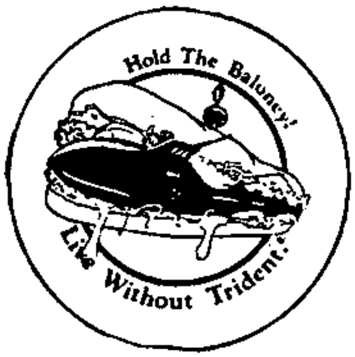
The overworked delusion that Trident stabilizes the nuclear standoff should have been thrown out with the Cold War. Yet we still hear about Trident submarines at sea being undetectable, which means they cannot be destroyed. That invulnerability is interpreted as stability because it discourages any would-be opponent from attempting a first strike against the US.

Today, Russia is the only country with weapons capable of attacking the US. But it no longer has the C^3I (Command, Control, Communication and Intelligence) infrastructure to carry out a coordinated operation. Russia may feel more vulnerable because of that. As they face US bombers and ICBMs, all the cards are on the table, so to speak. An opponent would have a sense of security in being able to watch them. If the US did strike, Moscow would have at least 30 minutes to fire back before their missiles are destroyed. Thus the Russians would feel they still had a deterrent.

Trident is another case. It can sneak around the ocean and attack quicker from all directions. During a crisis situation, if Moscow is really nervous, a misinterpreted false alarm could cause Russian missile commanders to retaliate immediately, thinking that if they hesitate they will never be able to do so. In any hypothetical scenario, Trident is a dangerous and destabilizing weapon.

2. Trident as a Nuclear Expeditionary Force.

The Reed Panel recommended in 1991 that America should create a nuclear expeditionary force which would include a few strategic air-launched and submarine-launched weapons, as well as tactical nuclear systems (see chapter 1.2). This force would be for use against China and Third World countries.



Trident could be launched against any target. But you don't need a pile driver to pound a carpet tack. Using Trident in this role is contrary to the trend in weaponry. Smart and precise conventional weapons are replacing nuclear across the board. Over a decade ago, nuclear torpedoes, and depth bombs were succeeded by Mark-46 and Mark-48 torpedoes. Nuclear anti-ship and anti-aircraft weapons have long ago given way to smart rockets. Battlefield nuclear weapons have recently been replaced with the Tactical Missile System and the Multiple-Launch Rocket System. Even the Spartan and Sprint anti-ballistic missiles (ABMs) have succumbed to hit-to-kill weapons -- Star Wars is non-nuclear.

B. TRIDENT AND THE BUSH-YELTSIN AGREEMENT

President Bush, in exchange for other concessions, committed the United States to reduce its submarine-launched ballistic missile warheads by one-half. But the agreement specifies a deadline of 2003 to be implemented. It appears that the Pentagon and its contractors, backed by the White House, plan to continue deployment of the US Trident fleet and then cut back after all profits have been reaped. US officials say they have not yet decided whether they will reduce warheads by removing half the missiles from the full compliment of 18 submarines, or by removing half the warheads from the full compliment of 432 missiles. What has been decided is that the planned fleet of 18 submarines will not be reduced. There are alternatives beyond these either/or plans.

1. Cancel the Contracts for the Last Four Submarines.

Thirteen Ohio-class Trident submarines have been commissioned and the fourteenth has been launched. Four more are in various stages of construction but not beyond the point of no return. If the contracts were cancelled there would be certain cancellation fees obligated, but the savings would go a long way toward alleviating the national deficit and rectifying America's social injustices. Much of the money saved could be used to help displaced workers find socially-useful employment.

2. Do Not Provide Funding for More Missiles.

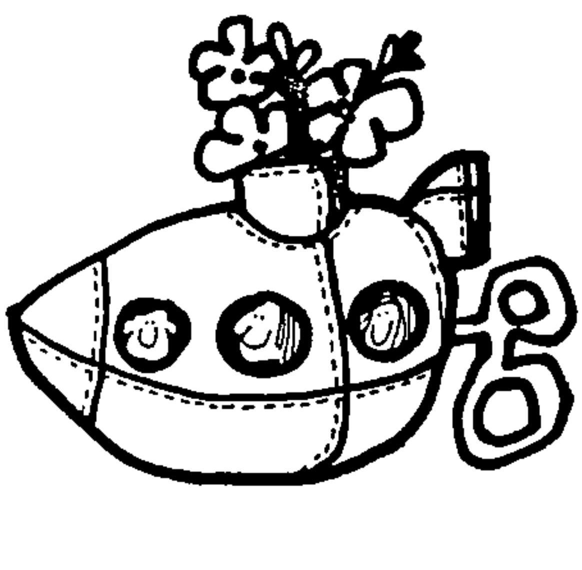
Since enough missiles have already been ordered to carry the 1,728 warheads allowed under the Bush-Yeltsin agreement, there is no need to buy any more. Again, there may be some cancellation costs but, far from what the arms producers would have us believe, those costs would be a small fraction of the savings. It is the policy in business that when an investment no longer serves its purpose that it be scrapped, and what savings possible salvaged. A corporate board does not keep a program going just because a huge sum has already been invested. It is not too much to ask that governments behave as fiscally responsible with our tax dollars as private corporations do with their stockholders' money.

During the 1992 session of the US legislature, Senator Dale Bumpers introduced a bill to stop Trident-2 missile production now that the Cold War is over and warheads are going to be halved. His bill did not pass but it opened the door to a heated debate on Trident in 1993. Pressure needs to be applied to make certain that the missiles are cut at that time -- along with the last four submarines.

Jobs for the 3,500 people working on Trident-2 will become a big argument for continuing the program. Those workers can be helped with many billions of dollars to spare. Jobs must not be accepted as an alibi for continuing with Trident. The unspoken obstacle to stopping missile production is the $1 billion a year profit for Lockheed.

3. Billions will be Saved by Halting Trident Now.

As shown in Chapter 6.3, stopping all Trident missile and submarine construction at the end of FY 1993, and retiring older ships to bring the fleet down to nine submarines, will save $33.6 billion over the life of the Trident fleet. It will save $13.3 billion by the end of the century, and $2.4 billion in FY 1994 alone.



C. ARGUMENTS FOR STOPPING THE BRITISH TRIDENT

America is not the only nation deluding its people about Trident. Britain has promulgated incredible reasons for its Trident fleet. They hinge around such catchy words as "national security," "minimum deterrence," and "independent deterrent." For every proffered reason there is a deflating counter argument.

1. An Expensive Status Symbol.

The announced reason for Britain's four-submarine Trident fleet is to maintain national security. But the term national security seems to be misconstrued as national prestige -- seeking some perceived status attached to membership in the nuclear club. Once in, being high in the pecking order provides certain delusions of advantage in international relations.

Trident assures the United States of remaining top dog in world affairs. But Britain is a runner-up in the nuclear pecking order. It's chief rival is France, which is turning out its own updated sea-based missile. Although the French M-4 SLBM does not match the Trident-2 in range or accuracy, it is much superior to the old Polaris missiles in Britain's remaining three Polaris submarines. Britain has to modernize or step off the ladder.

Field-Marshal Lord Carver, former Chief of Britain's Defence Staff, affirms that the British government is defending a position it has never been willing to publicly admit: "It is that, now we have established ourselves as a nuclear weapons power, we are not going to abandon the world power status we think that gives us, certainly not as long as France insists on retaining that position. It has never had, and certainly has not now, much to do with an effective defence policy." [The Guardian, 10 Feb 92]

2. The Dependency of an Independent Deterrent.

Britain could never acquire its Trident fleet without the aid of the United States. First of all, the submarines' missile sections and fire control rooms were designed in the US. Westinghouse in Sunnyvale, California furnished all 16 missile launch tubes for the first British boat.

The missiles are entirely furnished by the US on a lease basis. They will be returned to US Sub Base Kings Bay every seven years, at least, for exchange. British submarine crewmen will also be trained at Kings Bay.

Finally, the MIRVed reentry vehicle shell is purchased from the US. Even if Britain designed and developed its own, as in the case of Chevaline, it would have to be flight tested on a US missile range.

The bomb in the MIRV is ostensibly British. But it is, obviously, based on US design and tested at America's Nevada Test Site. All in all, the British label on the bomb is more a legal technicality than reality, because that bomb is undoubtedly a US clone.

After the submarine is operational it will still rely on the US for fulfilling its function. Since the extreme-low frequency (ELF) transmitter site once planned for Scotland has never been constructed, British Trident submarines will depend on the US ELF transmitter to call them up from the depths.

Once on the surface, or at launch depth, the submarine will have to accurately position itself by means of US NAVSTAR satellites. This is necessary or Trident missiles will have no more precision than Polaris. British missile-launching submarines also use the US Eastern Test Range in the Atlantic for practice firings, qualification tests, and crew training exercises.

Even after all that, Britain must still depend on US intelligence-gathering networks to define the targets, provide the launch trajectories, and determine when the missiles should be launched.

Will Trident be Britain's independent nuclear deterrent, even if there were something to deter? Hardly. Britain's Trident system has "Made in USA" stamped all over it. Britain cannot be number two, or even number three. British Tridents are nothing more than an extension of America's nuclear might.

Helping Britain to deploy Trident is nothing but the age-old game of arms trafficking, only at the nuclear level. Washington is doing nothing less than selling a nuclear missile system to another country. Such an act mocks the spirit of the Nuclear Non-Proliferation Treaty and presents serious obstacles to the quest for a more peaceful world.

3. *Minimum Deterrence of What?*

The MOD has "always made it clear that the United Kingdom would deploy only the minimum deterrent required for our security needs." [*Statement On The Defense Estimates 1992*, chapt. 1] But who will be deterred is not clear. It is even more fuzzy what constitutes a "minimum" deterrent. But throughout the 1980s it has been Britain's position that the Trident represents minimum deterrence and is therefore not subject to arms control negotiations. But after the seven to eleven years assigned to implement the START Treaty and the Bush-Yeltsin agreement, and if missile defense capabilities do not significantly advance, MOD officials say "we will consider what further contribution we might make to arms control in the changed circumstances." [*Statement On The Defense Estimates 1992*, chapt. 1] Further contribution?

So it would appear that citizens should be content with that vague definition and nebulous promise. That must not be the case. According to the House of Commons Defence Committee, "the justification for Trident, the number of warheads to be deployed and the scale of the strategic deterrent to that deployed by any potential enemy are once again legitimate political and military issues ..." [HC-337, p. vi] It would be healthy to a freely-elected government that the details of those issues be publicly aired and debated.

4. The Fourth Sub is Superfluous.

From a critical viewpoint, all Trident submarines are superfluous. But even in government circles, the need for a fourth sub is debatable.

The MOD claims that four Trident subs are required to maintain one on-station at all times because of the margin for accidents (a discomforting thought). [The Guardian, 15 Jan 92] But let us look at the schedule. With only two submarines, and assuming British cycles to be the same as US, the 70-day patrol period and 30-day turn around allows one of them to be on-station at all times, and both on-station 40 percent of the time. Adding a third boat would allow one to be in overhaul, one in turn around, and at least one always on-station.

With one-year-duration overhauls scheduled at seven year intervals, a submarine would only be in overhaul for three years out of seven. During the other four years there would be at least two subs on station at all times. Only by grasping extreme possibilities, whatever they may be, can a fourth submarine be needed. And if worst-case possibilities are possible, even one submarine is too many to have anywhere.

This juggling of numbers becomes even more ridiculous when one realizes that Trident submarines are on-station even while in port. With the long-range Trident missiles the submarine does not have to travel great distances to reach its targets. Neither does the sub have to be submerged at sea to launch its missiles.

An interesting discussion took place in Parliament on 5 March 1992 regarding submarine readiness. [See HC-337, pp. 6-7] It was pointed out to Rear Admiral Ian Pirnie that the French have five ballistic-missile submarines with four always deployed (the fifth being in overhaul). Of those four deployed, three were always kept on station. The admiral was asked how the French can do that while the British need three submarines (sometimes only two deployed) to keep one at sea all the time? Admiral Pirnie refused to speculate on how the French operate their force or the definitions they were using. Neither did he explain how the British would operate or the definitions they use. It is safer to remain silent when something can't be explained.

5. Trident Makes Britain More Aggressive.

Deploying the new submarine and missile system shows impudent disregard of the NPT by giving Britain a more offensive military posture. This new nuclear stance is manifested in four ways.

a. Offensive Escalation In Numbers Of Targets. With official assurance that each *Vanguard*-class submarine will carry no more than 128 warheads, at least initially, it seems appropriate to assign an average of eight to each of its 16 Trident-2 missiles. How does that sum up? If we examine the Polaris submarine force, we can calculate that the four boats, carrying sixteen missiles each, will have a total of 64 Polaris missiles. Since each missile can attack only one target, the Polaris fleet can attack 64 cities, assuming all the subs are available at one time, which they are not. That is a terrible toll but it gets worse with Trident.

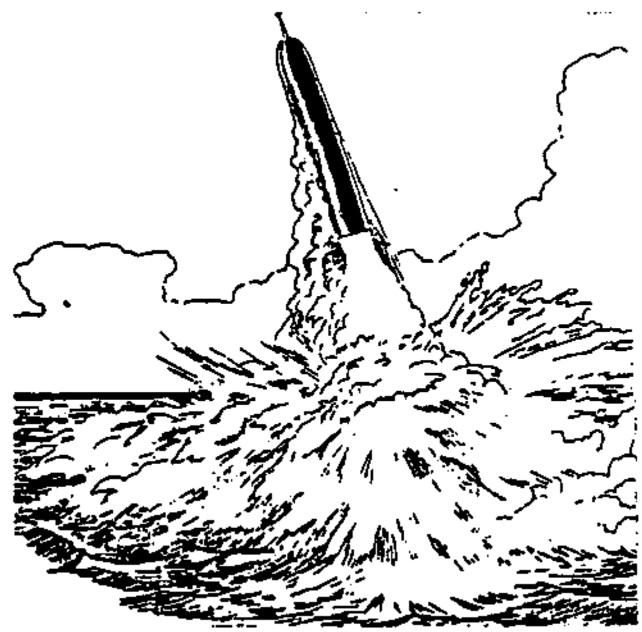
With each of the new Trident missiles carrying eight independently-targetable warheads, the number of targets which can be attacked rises to 512 -- an eight-fold increase over Polaris.

b. **Offensive Escalation In Types Of Targets**. Even though the Chevaline warhead carried on British Polaris missiles is a MARV, it is not a precision MARV. It can only perform a pre-programmed roll intended to evade interceptor missiles. That maneuver makes Chevaline less accurate. So Polaris missiles can only threaten large and sprawling targets such as cities.

Trident-2's 100-kiloton warheads, on the other hand, with their 400-500 foot maximum miss distance, approach a first-strike capability. If the missile has in-flight guidance updates from NAVSTAR satellites, it will be able to destroy the hardest of targets. While Polaris is only good as a city blaster, Trident-2 can land precisely within destruction distance of its aim point.

c. **Offensive Escalation In Range To Targets**. Range also fits into the picture. Polaris missiles, with a reach of 2500 nautical miles, can reach all of the former Soviet Union lying west of the Ural Mountains. They threaten Moscow, Kiev, and St. Petersburg while close to home base, but they can barely reach the Mid East.

Trident-2, on the other hand can reach out some 4,230 nautical miles with a full load. That covers the entire Mid East as well as large portions of China, India, and Northern Africa. But eight 100-kiloton warheads is by no means a full load, and so the range will be significantly greater -- possibly more like 6,000 nautical miles. Those warheads could reach such countries as South Africa, eastern China, and much of South America -- they could essentially cover half the earth's surface from their launch point.



d. **Offensive Escalation In Quality**. Another aspect of proliferation is the type of warhead planned for Trident. While the US and the former Soviet nuclear states plan to dramatically cut their inventory of MIRVed warheads, Britain is for the first time deploying MIRVs. MIRVs complicate treaty verification -- that is why SALT-1 and SALT-2 only limited nuclear delivery vehicles, not the warheads. MIRVs quickly multiply the number of nuclear bombs while maintaining the same number of carrier vehicles -- switching from Polaris to Trident is a striking example. Deploying MIRVs is counter to the global trend and a blatant affront to sincere arms-reduction efforts.

Clearly -- by increasing the number of targets, changing the types of targets, threatening more countries at greater range, and introducing MIRVs -- the British Trident fleet is going to be grossly more destabilizing and volatile than Polaris. Trident will be a major step in aggression and proliferation.

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9.3 ALTERNATIVES TO MILITARY FORCE

This chapter is a challenge. Given below is a scant outline of the problems facing a policy of nonviolence. As we put our heads together and pool ideas, this chapter will grow to become a dynamic tool for applying nonviolence to international relations. Specific issues will be addressed in an attempt to find acceptable nonviolent solutions.

A. HOW ABOUT THE SANCTIONS?

Sanctions are stronger, longer-lasting, and more humane than military solutions, although maybe not as immediate. The term "sanctions," however, encompasses many things. There should be discrimination regarding types of sanctions because some can be more devastating than war itself.

Military sanctions are usually the first imposed -- to cut off the flow of munitions and supplies that support the target country's military capability. Materials and technology for building weapons of mass destruction should always be denied.

Diplomatic sanctions are also pretty straightforward. The target country is essentially ostracized from the international community. Serbia and Montenegro were rightfully denied recognition as the successor to Yugoslavia, thus denying them the Yugoslav seat in the UN. They were also rightfully suspended from the Conference on Security and Cooperation in Europe (CSCE). Croatia should also be suspended from both the UN and CSCE as long as it occupies territory in Bosnia. Such isolation is often sufficient to bring an oppressive government to its senses. But usually diplomatic sanctions are backed by economic penalties.

Economic sanctions cannot be described so simply. They can range from token measures to such extremes that human rights are violated. People of the target country should never be deprived the necessities of life. A case in point is present-day Iraq. Economic sanctions, applied across the board, are depriving the Iraqi people of adequate food and medical care. Their social infrastructure has been devastated and the boycott of Iraqi oil blocks the only source of income to rebuild that infrastructure. Some peace and justice groups now advocate lifting certain aspects of the sanctions against Iraq.

On the other hand, conveniences should be cut off, and that could effectively persuade the people to change their government. But that persuasion should be so structured that the people recognize why sanctions are necessary and where the blame belongs. It is also important that sanctions do not incite additional violence.

Economic sanctions which hurt the industry needed to support an oppressive government, but do not deprive people of necessities, are the most effective. When big business found that the Vietnam conflict was hurting profits, it didn't take long for the US to cease its involvement. It is usually the profit-making aspect of economics which start wars, and hurting that aspect can quickly resolve hostilities.

For acceptable economic sanctions to work, they must be absolute, consistent and enforced. Absolute in the sense that everything except basic human needs are cut off. Consistent to the point of effectively monitoring everything going into the target country. Enforced by penalizing those countries which fail to cooperate -- such as Jordan during the Persian Gulf war -- with secondary sanctions. Above all, sanctions must be given time to be effective. The more they are absolute, consistent and enforced, the quicker they will become effective.

1. Former Yugoslavia as an Example.

When the European Community (EC) imposed an embargo against Serbia and Montenegro during the invasion of Croatia, those sanctions did perturb an already reeling economy and spark some anti-war protest. But those sanctions were effective only to the extent EC members complied. The US added the first of its diplomatic sanctions on 22 May 1992, and a full diplomatic break on June 23rd. These also had some effect. The Serbian Orthodox Church -- often known to be more Serbian than Orthodox -- denounced its own government, and the bishops' conference indirectly called on President Slobodan Milosevic to step down.

But it was not until the UN Security Council imposed a mandatory embargo of all but food and medicine that sanctions were absolute. In Belgrade, Yugoslavia's capital, tens of thousands of anti-government demonstrators -- described as the largest protest since March 1990 when Yugoslav army tanks were brought in to patrol Belgrade streets -- were calling for the Serbian president to step down.

By late June 1992 in Belgrade, UN-imposed sanctions were biting deeply. The economy was shattered and internal politics became increasingly stormy. Inflation climbed more than ten percent a day -- a 5,000 dinar note worth $550 three weeks before had dropped to $2.70. Textile industries shut down and virtually all construction was suspended. Tens of thousands of people had been laid off. Pensioners were especially devastated. Students occupied the university daily demanding that President Milosevic step down. The Serbian Orthodox Church continued to demand his resignation. Political opponents and ex-rulers in exile were becoming stronger.

2. Why Haven't Sanctions Stopped the Fighting?

We don't really know how consistent UN sanctions are being observed because the Western European Union (WEU) and NATO ships in the Adriatic Sea did not until recently have authority to turn away vessels suspected of violating the embargo. But if a given vessel refuses to be inspected, the country whose flag it flies should immediately be the target of sanctions strong enough to enforce cooperation. The continuing "ethnic cleansing" in Bosnia-Herzegovina indicates that some nations are not cooperating with the sanctions.

When the UN and its member nations really become sincere about forcefully imposing proper sanctions, it will in the long run prevent more death and suffering than military solutions. While eschewing sanctions which violate human rights, other embargoes should be applied immediately, and applied hard.

B. NON-LETHAL WEAPONS

Another approach which should be cautiously considered for stopping an international injustice is the use of non-lethal force. Just as we sometimes have to restrain one of our children to prevent harm, it seems reasonable to use nonviolent force to prevent great tragedies. Nonviolent force shouldn't have to be confined to purely non-cooperation, which is the basic theory behind sanctions. Nevertheless, non-lethal force could be a controversial area and should be approached with caution.

Existing non-lethal weapons are reportedly designed to eliminate casualties and long-term industrial damage. According to Senate Armed Services Committee Chairman Sam Nunn, the Pentagon has "extensive capabilities that ... ought to be looked at carefully." [*AW&ST*, 17 August 1992, P. 62]

1. Carbon-Fiber String.

Although non-lethal weapons are hidden in the depths of military secrecy, it is known that some were used during the Persian Gulf war. Tomahawk cruise missiles carried warheads loaded with thousands of spools of carbon-fiber string. When released in the air they would unravel like a roll of toilet paper dropped from an airplane. When those fibers fell across the outdoor transmission grid networks of powerplants, the resultant shorting caused wide-spread electrical disruption. According to Warren Piper, a retired senior official of Boston's Stone & Webster Engineering Company who helped assess the war damage in Iraq, "close to all" the electrical networks of Serbia could be shut down for at least a few days with similar carbon-fiber attacks. [*AW&ST*, 17 August 1992, P. 62]

Since Serbia is highly dependent on electricity, such a shutdown would affect oil and gas pumping, food processing and storage, water and sewage disposal, and transportation. Repeated attacks could burn out transformers and other electrical equipment.

2. Electro-Magnetic Pulse Generator.

There has also been mention of an EMP-generator warhead carried on cruise missiles. The generated electro-magnetic pulse damages local electrical equipment with a power surge. An EMP generator may be a euphemism for a large explosive warhead. If so, it would probably not be desirable.

3. Chemical Compounds and Microbes.

Other non-lethal weapons are chemical compounds which destroy an aircraft's tires when sprayed on runways, and microbes which can turn large storage tanks of jet fuel into useless jelly. If these are harmless to humans they may be acceptable. But if they reach the threshold of chemical and biological weapons, they must be carefully scrutinized.

4. Electronic Warfare.

Non-lethal electronic warfare has been in use for many years -- jamming the target country's television/radio reception or broadcasting information to counter their own government's propaganda. Even the old World War II tactic of dropping leaflets would have a place in certain instances.

Perhaps we should stop using such terms as military force and sanctions. Perhaps the distinction should be between lethal and non-lethal means of persuasion. But whatever it is called, when our intellectual resources are turned toward developing non-lethal innovations rather than smarter weapons, all sorts of techniques will become available.

C CAN MILITARY FORCE EVER BE JUSTIFIED?

Saying that military force may be justified under certain conditions comes dangerously close to endorsing the just-war theory. Nevertheless, situations in today's world seem not to lend themselves to either/or solutions. There are many shades of gray which must be recognized and dealt with. In our society, where street gangs and dope rings run rampant, would we be willing to lay off the police force?

At the time of this writing, US Marines are preparing to open relief routes in Somalia. There is bound to be bloodshed. But if those troops stick to the stated purpose of their intervention, is this incursion morally right? Will the lives saved outweigh the lives lost? (The old proportionality justification.) Or, is it a case where lives of guilty looters would be sacrificed rather than innocent men, women and children starving to death?

The UN has now approved the use of force in monitoring the blockade of former Yugoslavia. How far is military action morally justified? A warning shot across the bow may be harmless but what if the blockade-running ship fails to stop? Perhaps it would be acceptable to shoot off its rudder. Can or should the use of force go beyond that? What if the ship shoots back? What if it is escorted by fighting ships?

There are a lot of sticky questions popping up in current events. They are a headache for the moralist and a nightmare for the advocate of nonviolence. How shall those questions be answered?

[Editor's note: I have not included the above material to express my thinking. I do not know where I stand on these issues. They are included here to stimulate thought and promote an exchange of ideas so we can arrive at reasonable alternatives to violence.]

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GLOSSARY

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GLOSSARY

A-1	US Navy designation for first generation Polaris SLBM.
A-2	US Navy designation for second generation Polaris SLBM.
A-3	US Navy designation for third generation Polaris SLBM.
AAM	Air-to-Air Missile.
ABC	Atomic, Biological and Chemical. Also American Broadcasting Company.
ABM	Anti-Ballistic Missile. An interceptor of ballistic missiles.
ACM	Advanced Cruise Missile.
AEC	Atomic Energy Commission, predecessor to the DOE (US).
AFSATCOM	Air Force SATellite COMmunication system (US).
ALCM	Air-Launched Cruise Missile.
ARCTICSATCOM	ARCTIC SATellite COMmunication System (US).
ARPA	Advanced Research Projects Agency.
AS-1	A CIS ASM.
AS-3	A CIS ALCM.
AS-4	A CIS ASM.
AS-6	A CIS ASM.
AS-15	A CIS ALCM.
AS-16	A CIS ASM.
ASLP	Air-Sol Longue Portee (Air-to-Surface Long-range Missile -- French).
ASM	Air-to-Surface Missile.
ASMP	Air-Sol Moyenne Portee (Air-to-Surface Medium-range Missile -- French).
ASROC	Anti-Submarine ROCket, fired from surface ships (US).
ASW	Anti-Submarine Warfare.
ATBM	Anti-Tactical Ballistic Missile -- also called Anti-Tactical Missile (ATM).
ATM	Anti-Tactical Missile -- also called Anti-Tactical Ballistic missile (ATBM).
AWE	Atomic Weapons Establishment (Britain).
AW&ST	*Aviation Week & Space Technology.*
B-1	A US heavy, long-range bomber.
B-2	Newest US heavy, long-range bomber.
B-52	A US heavy, long-range bomber.
BASIC	British American Security Information Council.
BBC	British Broadcasting Company.
Backfire	A CIS medium-range bomber.
Bear-H	A CIS strategic bomber.
Blackjack	Newest CIS strategic bomber.
BNL	Banca Nationale de Lavoro (Italy's largest state-owned bank involved with illegal loans to Iraq).
Bus	The Post Boost Control System (PBCS) to which the warheads are attached, and from which they are dispensed.
C-3	US Navy designation for the Poseidon SLBM.
C-4	US Navy designation for the Trident-1 SLBM.

C^3I	Command, Control, Communication and Intelligence.
CBO	Congressional Budget Office (US).
CEP	Circular Error Probable -- the miss distance of a nuclear delivery vehicle.
CFE	Conventional Forces in Europe.
Chevaline	A British MARV for its Polaris missile.
CIA	Central Intelligence Agency (US).
CIS	Commonwealth of Independent States (11 of the 15 former Soviet republics).
CND	Campaign for Nuclear Disarmament (Britain).
CPO	Chief Petty Officer.
CRS	Congressional Research Service (US).
CSCE	Conference on Security and Cooperation in Europe (52 members including all 16 members of NATO as well as other western and eastern European countries along with former Soviet republics).
CSS-2	A Chinese INF missile.
CSS-3	A Chinese ICBM.
CSS-4	A Chinese ICBM.
CSS-N-3	A Chinese SLBM.
D-5	US Navy designation for the Trident-2 SLBM.
DARPA	Defense Advanced Research Projects Agency, now ARPA (US).
DASO	Demonstration And Shakedown Operations for submarines.
DOD	Department of Defense (US).
DOE	Department Of Energy (US).
DSCS	Defense Satellite Communication System (US).
E-6A	The new TACAMO aircraft, a Boeing 707 derivative (US).
EC	European Community (12 members: Austria, Belgium, Britain, Finland, France, Denmark, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, and Sweden).
EEI	Enhanced Electrical Isolation. The same as ENDS.
EHF	Extreme High Frequency.
EIS	Environmental Impact Statement.
ELF	Extreme Low Frequency.
EMP	Electro-Magnetic Pulse.
ENDS	Enhanced Nuclear Detonation Safety
ESGN	Electrostatically Supported Gyro Navigator.
ES&H	Environmental, Safety and Health.
EXPO	EXtended-range POseidon.
FBM	Fleet Ballistic Missile.
FLTSATCOM	FLeeT SATellite COMmunication system (US).
FROG-7	A CIS SRBM.
FRP	Fire Resistant Pits.
FY	Fiscal Year (US). Financial Year (Britain).
GAO	General Accounting Office (US Congress).
GATT	General Agreement on Trade and Tariffs.
GE	General Electric.
GLCM	Ground-Launched Cruise Missile, a former US INF weapon.
GNP	Gross National Product.

GPS	Global Positioning System.
HAC	House Appropriations Committee (US).
HASC	House Armed Services Committee (US).
HC	House of Commons (British).
Hertz	One cycle per second.
HMS	His/Her Majesty's Ship (British).
HMX	A base for more conventional high explosives. (Non-IHE explosives)
Hz	Hertz
IAEA	International Atomic Energy Agency (A UN agency).
ICBM	Inter-Continental Ballistic Missile.
IRBM	Intermediate-Range Ballistic Missile.
IHE	Insensitive High Explosive.
IMF	International Monetary Fund.
INF	Intermediate-range Nuclear Force.
IOC	Initial Operational Capability
IRBM	Intermediate-Range Ballistic Missile, an INF weapon.
kiloton	Nuclear yield equal to 1,000 tons of conventional explosives.
knot	One nautical mile per hour (1.1516 statute miles per hour).
kt	kiloton.
Lance	A US land-based SRNF missile.
LANL	Los Alamos National Laboratory (US).
LF	Low Frequency.
LIC	Low Intensity Conflict.
LLNL	Lawrence Livermore National Laboratory (US).
LMSC	Lockheed Missiles and Space Company.
Loran-C	A semi-worldwide land-based navigation system.
M-4	New French SLBM.
Mark-3	Reentry vehicle used in the 40-kiloton MIRV for US Poseidon missiles.
Mark-4	Reentry vehicle used in the 100-kiloton MIRV for Trident missiles.
Mark-5	Reentry vehicle used in the 475-kiloton MIRV for US Trident-2 missiles.
Mark-12A	Reentry vehicle used in the 335-kiloton MIRV for US Minuteman-3 missiles.
Mark-21	Reentry vehicle used in the 330-kiloton MIRV for US MX missiles.
Mark-500	A MARV designed for US Trident-1 missiles.
MARV	MAneuvering Reentry Vehicle.
Midgetman	A US small ICBM never deployed.
MILSTAR	MILitary Strategic and TActical Relay satellite (US).
Minuteman-2	A US ICBM.
Minuteman-3	A US ICBM.
MIRV	Multiple Independently-targeted Reentry Vehicles.
MP	Member of Parliament (Britain)
MRBM	Medium-Range Ballistic Missile.
MRV	Multiple Reentry Vehicle (not independently- targeted).
mt	megaton.
MX	A US ICBM.
N/A	Not Available.
NASA	National Aeronautics and Space Administration (US).
NATO	North Atlantic Treaty Organization (16 members: Belgium, Britain, Canada, Denmark, France, Germany, Greece, Iceland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Turkey, and the United States).

Nautical mile	One minute of one degree arc distance at the equator, 1.1516 statute miles, or 1.853 kilometers..
NAVSTAR	NAVigation System Timing And Ranging, a GPS satellite (US).
NOAA	National Oceanic and Atmospheric Administration (US).
Nodong-1	A North Korean SRBM. Also called a Scud-C.
NPA	New Peoples' Army (Philippines).
NPT	Nuclear NonProliferation Treaty.
NSF	National Science Foundation (US).
NTS	Nevada Test Site (US).
OMB	Office of Management and Budget (White House).
Omega	A worldwide land-based navigation system.
OPS	One Point Safety.
OT	Operational Test.
OTA	Office of Technology Assessment (US Congress).
PAL	Permissive Action Links, a safety device for nuclear warheads.
PBCS	Post-Boost Control System, the section of the missile to which the warheads are attached, and from which they are dispensed. Also called the "bus."
PCB	Polychlorinated biphenyl.
PCDS	Pacific Campaign for Disarmament & Security.
Pershing-1A	A former US SRINF missile, once used by West Germany.
Pershing-2	A former US land-based INF missile.
PLRC	Pacific Life Research Center.
PLYWD	Precision Low-Yield Weapons Design.
Polaris	A US SLBM (the A-3 version is still operational in Britain). Also the submarine carrying those SLBMs.
Poseidon	A US SLBM. Also the submarine carrying those SLBMs.
PRC	Peoples Republic of China.
PWR	Pressurized Water Reactor.
R&D	Research and Development.
RDT&E	Research, Development, Testing and Evaluation.
RAF	Royal Air Force (Britain).
RN	Royal Navy (Britain)
RNAD	Royal Navy Armament Depot (Britain).
SAC	Senate Appropriations Committee (US).
SALT	Strategic Arms Limitation Talks.
SASC	Senate Armed Services Committee (US).
SCOOP	SSBN Continuity Of Operations Program (US).
SH-08	A CIS ABM.
SH-11	A CIS ABM.
SIG	Stellar Inertial Guidance.
SINS	Ship Inertial Navigation System.
SJMN	San Jose (CA) *Mercury News*.
SLBM	Submarine-Launched Ballistic Missile.
SLCM	Sea-Launched Cruise Missile.
SNDV	Strategic Nuclear Delivery Vehicle.
SRAM-2	US Follow-on Short-Range Attack Missile, now cancelled.
SRAM-A	Short-Range Attack Missile currently deployed (US).

SRAM-T	Tactical version of the SRAM-2, now cancelled.
SRB	Special Reentry Body.
SRBM	Short-Range Ballistic Missile, a SRNF weapon.
SRINF	Short-Range INF.
SRNF	Short-Range Nuclear Force.
SRS	Savannah River Site (US).
SS-1C	A CIS SRBM.
SS-4	A former USSR land-based INF missile.
SS-11	A CIS ICBM.
SS-12	A former USSR land-based SRINF missile.
SS-13	A CIS ICBM.
SS-17	A CIS ICBM.
SS-18	A CIS ICBM.
SS-19	A CIS ICBM.
SS-20	A former USSR land-based INF missile.
SS-21	A CIS SRBM.
SS-23	A former USSR land-based SRINF missile.
SS-24	A CIS ICBM.
SS-25	A CIS ICBM.
SSBN	Ship, Submersible, Ballistic-missile, Nuclear-powered. Designation for a nuclear-powered ballistic-missile-launching submarine.
SSC-1B	A CIS GLCM.
SSM	Surface-to-Surface Missile.
SS-N-3	A CIS SLCM.
SS-N-5	A CIS SLBM.
SS-N-6	A CIS SLBM.
SS-N-7	A CIS SSM.
SS-N-8	A CIS SLBM.
SS-N-9	A CIS SSM.
SS-N-12	A CIS SSM.
SS-N-14	A CIS ASW Missile.
SS-N-15	A CIS ASW Missile.
SS-N-17	A CIS SLBM.
SS-N-18	A CIS SLBM.
SS-N-19	A CIS SLCM.
SS-N-20	A CIS SLBM.
SS-N-21	A CIS SLCM.
SS-N-22	A CIS SSM.
SS-N-23	A CIS SLBM.
START	STrategic Arms Reduction Talks.
StratCom	Strategic Command (Formerly the Strategic Air Command -- US).
Strategic	Pertaining to nuclear weapons, those inter-continental missiles and bombers designed for a thermonuclear war between the superpowers.
SUBROC	SUBmarine ROCket, fired from one submarine at another submarine (US).
SUW-N-1	A CIS ASW Missile.
SWERVE	Sandia Winged Energetic Reentry Vehicle Experiment (US).
SWS	Strategic Weapons System. Refers directly to the production, support and operation of missiles and warheads. Other operations such as training, submarine facilities, and submarine refit are non-SWS.

TACAMO	TAke Charge And Move Out, a US airplane for communicating with submarines.
Tactical	Regarding nuclear weapons, those designed to be used in battlefield or theater operations.
TASM	Tactical Air to Surface Missile.
TATB	An insensitive high explosive. (IHE)
TDG	Technology and Development Group (an Iraqi front company near London).
Tomahawk	Another name for the US GLCM and SLCM.
Transit	An early US navigation satellite.
Trident	Type of SSBN (US & Britain).
Trident-1	A US SLBM.
Trident-2	Newest US SLBM. Also to be leased to Britain.
ULMS	Underwater Long-range Missile System.
UN	United Nations.
US	United States.
USS	United States Ship.
USSR	Union of Soviet Socialist Republics.
UTC	United Technologies Corporation (US).
VLF	Very Low Frequency.
VSEL	Vickers Shipbuilding and Engineering Ltd (Britain).
V/STOL	Vertical/Short Take-Off and Land aircraft.
W-69	40-kiloton hydrogen bomb used in the US Mark-3 MIRV.
W-76	100-kiloton hydrogen bomb used in the US Mark-4 MIRV.
W-78	335-kiloton hydrogen bomb used in the US Mark-12A MIRV.
W-87	330-kiloton hydrogen bomb used in the US Mark-21 MIRV.
W-88	475-kiloton hydrogen bomb used in the US Mark-5 MIRVs.
WEU	Western European Union (9 members: Belgium, Britain, France, Germany, Italy, Luxembourg, Netherlands, Portugal, and Spain).
w/h	Warhead
yield	The explosive energy of a nuclear bomb.

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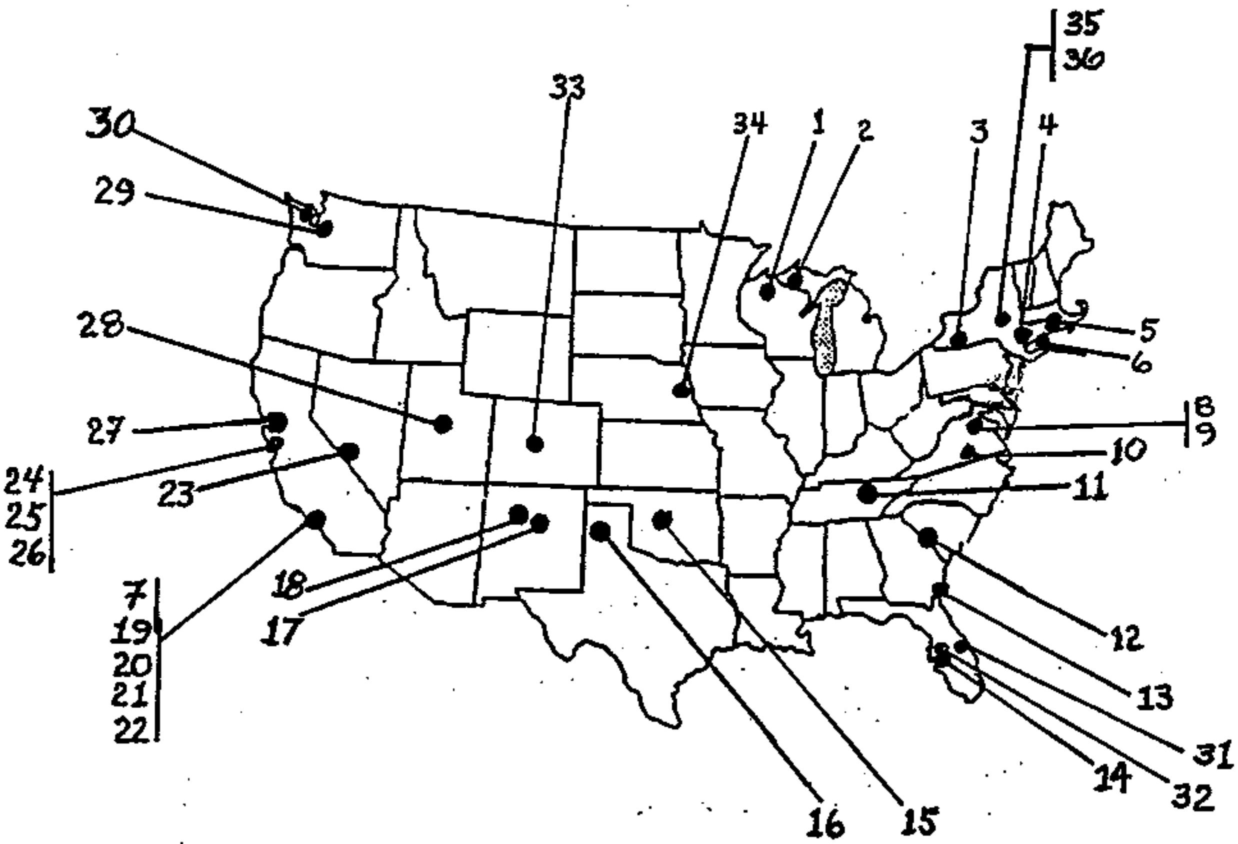
APPENDICES

A

APPENDIX A

MAP OF US TRIDENT ACTIVITIES



1 Clam Lake (WI)
Extreme Low Frequency (ELF) transmitter.

2 Sawyer Air Force Base (MI)
Extreme Low Frequency (ELF) transmitter.

3 Sperry Systems Management (Great Neck, NY).
Submarine navigation system.

4 Lockheed Martin (Pittsfield, MA).
Submarine fire control system.

5 Charles Stark Draper Laboratory, Inc. (Cambridge, MA).
Missile guidance package.

6 General Dynamics, Electric Boat Div. (Groton, CT)
Submarine prime contractor.

7 Hughes Aircraft Company (El Segundo, CA)
Missile guidance electronics.

8 Pentagon (Arlington, VA)
US National Military Command Center.

9 White House (Washington, D.C.)
Commander-in-Chief of US Armed Forces.

10 Atlantic Research Corporation (Gainsville, VA)
Missile post-boost gas generators.

11 Y-12 Plant (Oak Ridge, TN) DOE -- Managed by Lockheed Martin Energy & Environment.
Provides uranium warhead components and lithium for SRS reactor.

12 Savannah River Site (SRS) (Aiken, SC) DOE -- Mgd by Westinghouse Savannah River Co.
Tritium production.

13 Sub-Base Kings Bay (GA)
East coast Trident base.

14 Honeywell, Inc. (Clearwater, FL)
Manufactures missile guidance components.

15 Tinker Air Force Base (OK)
TACAMO E-6A base.

16 Pantex (Panhandle, TX) DOE -- Managed by Mason & Hanger.
Assembly and disassembly of nuclear weapons.

17 Sandia National Laboratory (Los Alamos, NM) -- Mgd by Lockheed Martin Energy & Env.
DOE Nuclear bomb design and recycling.

18 Los Alamos National Laboratory (LANL) (Los Alamos, NM)
DOE Nuclear bomb design. Univ. of Calif. administers.

19 Ford Aerospace and Communications (Newport Beach, CA).
Missile integrated post-boost valves.

20 Northrop Corporation (Annaheim, CA).
Missile checkout equipment.

21 Rockwell International (Annaheim/ Seal Beach, CA)
Submarine inertial navigation system, NAVSTAR
Satellites, Submarine sonar acoustic processing systems.

22 Interstate Electronics Corporation (Annaheim, CA).
Submarine instrumentation.

23 Nevada Test Site (NV)
DOE Nuclear bomb testing.

24 Lockheed Martin Missiles & Space (Sunnyvale, CA)
Missile prime contractor. MILSTAR, NAVSTAR, and BMD contractor.

25 United Technologies Corp., Chemical Systems Div. (San
Jose, CA) Missile third-stage motor.

26 Westinghouse Marine Division (Sunnyvale, CA)
Submarine missile-launching system (launch tubes).

27 Lawrence Livermore National Laboratory (LLNL)(Livermore,CA)
DOE Nuclear bomb design. Univ. of Calif. administers.

28 Morton Thiokol Inc. & Hercules Aerospace Div. (Magna, UT)
Missile first- and second-stage motors.

29 Boeing, Co. (Seattle, WA)
Manufactures TACAMO E-6A aircraft.

30 Sub-Base Bangor (WA)
West coast Trident base.

31 Cape Canaveral (FL)
Launch site for NAVSTAR satellites

32 Pinellas Plant (Largo, FL) DOE -- Managed by Lockheed Martin Energy & Environment.
Makes neutron generators for hydrogen bombs.

33 Falcon Air Force Base (Colorado Springs, CO)
Master control station for NAVSTAR satellites.

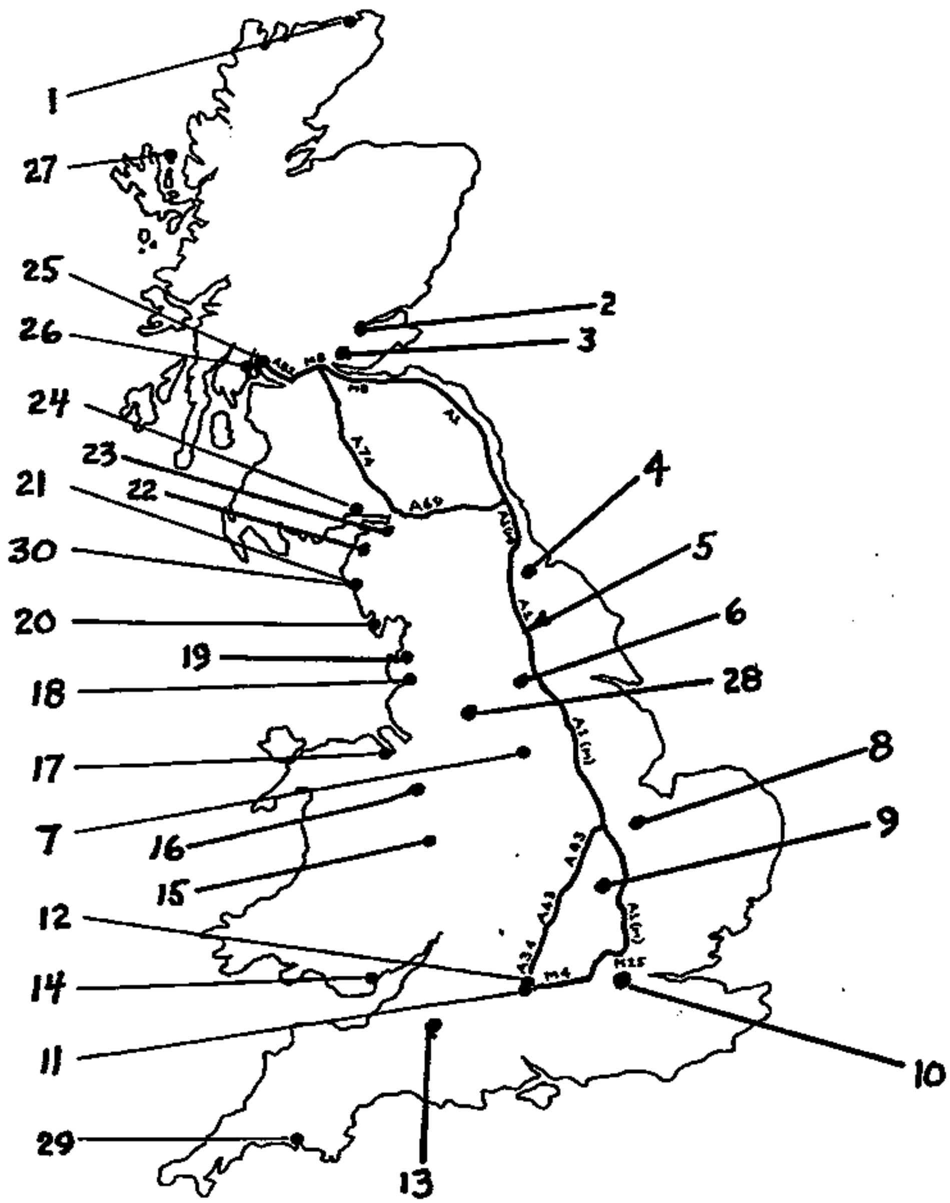
34 Strategic Command (near Omaha, NE)
Command and Control of all US nuclear weapons.

35 Lockheed Martin (West Melton, NY)
Submarine propulsion system.

36 Knolls Atomic Power Lab (Schnectedy, NY) DOE-- Mgd by Lockheed Martin Energy & Env
Nuclear propulsion crew training.

APPENDIX B

MAP OF BRITISH TRIDENT ACTIVITIES



1 Dounreay.
Prototype Trident nuclear reactor -- test & training site.

2 Pitreavie Castle
Royal Navy Very Low Frequency (VLF) transmitter.

3 Rosyth Dockyard
To preform Trident submarine overhaul.

4 Albermarle (near Newcastle)
High-security overnight stopover for warhead convoys.

5 Motorways
Main warhead convoy routes, Burghfield-to-Coulport.

6 Forest Moor
Royal Navy communications receiver station.

7 Rolls Royce, Derby
Submarine nuclear reactor and fuel rods.

8 RAF Wittering (near Peterborough).
High-security overnight stopover for warhead convoys.

9 Rugby
Very Low Frequency (VLF) transmitter.

10 Northwood (London).
Joint Maritime Headquarters -- command of submarines.

11 AWE Burghfield (near Reading) -- Managed by Hunting Brae.*
Final assembly point for British nuclear weapons.

12 AWE Aldermaston -- Managed by Hunting Brae.*
Warhead nuclear component manufacture.

13 Bath (Foxhill).
Submarine design -- engineering dev. & constr. support.

14 AWE Cardiff -- Managed by Hunting Brae.*
Warhead casing and component factory.

15 Criggion.
Very Low Frequency (VLF) transmitter.

16 Swynnerton (near Stafford)
High-security overnight stopover for warhead convoys.

17 Capenhurst.
Uranium enrichment plant.

18 Springfields.
Nuclear processing -- uranium hexaflouride for warheads and reactor fuel.

19 Inskip.
Low Frequency (LF) transmitter.

20 VSEL-Vickers (Barrow-in-Furness)
Submarine contractor.

21 Sellafield (formerly Windscale).
Nuclear re-processing plant -- plutonium for warheads.

22 Ampthorn
Low Frequency (LF) transmitter.

23 Longtown (near Carlisle).
High-security overnight stopover for warhead convoys.

24 Chapel cross.
4 Magnox nuclear processing reactors -- plutonium & tritium for warheads.

25 Clyde Sub-Base Faslane (Gare Loch on Clyde)
Submarine base for Trident.

26 RNAD Coulport (Long Loch on Clyde).
Warhead storage.

27 Rona.
Sonar range.

28 Ferranti-Thompson (Cheadle Heath)
Sonar equipment for Trident submarines.

29 Devonport Dockyard
To perform Trident submarine maintenance. Fuel and defuel submarine reactors.

30 Calder Hall
4 Magnox nuclear processing reactors -- plutonium for warheads.

*Hunting Brae is a consortium of three contractors: Hunting Engineering a weapons manufacturer), Brown & Root (an American company), and AEA Technology (formerly the UK Atomic Energy Authority which was responsible for development of nuclear energy).

APPENDIX C

ESTIMATED TOTAL COST OF US 18-SUB TRIDENT SYSTEM
THROUGH THE YEAR 2032
(In then-year US dollars)

Following is a cost breakdown for the complete US Trident program -- from inception to 2032. It includes backfitting Trident-1 missiles into Poseidon submarines along with estimated support and operation costs for those submarines (not for the missiles). Although the total cost seems astronomical, it is the best compilation possible from public sources. Even so, it may be conservative. The support and operation costs for Trident-1 missiles associated with Poseidon submarines is not included. In some cases, DOE expenses and government-furnished equipment are known to be excluded, and in others it is not known whether such expenses and equipment are excluded or not. So even this huge total may be too low.

Cost of backfitting 12 Poseidon submarines with Trident-1 missiles. [a]	+$ 3.6 billion
Operating and support cost for 12 backfitted Poseidon submarines, 1979-1999. Operation and support cost for missiles is not included. [b]	+$ 7.7 billion
Cost of first 8 Trident submarines, associated Trident-1 missiles, and the base at Bangor, Washington. [a] [c]	+$ 16.9 billion
Strategic Weapons System (SWS) research and development (R&D). 28 development Trident-2 missiles. 815 production Trident-2 missiles for 19-submarine fleet. Operation and support costs for SWS subsystems. Convert 8 Trident-1 submarines to Trident-2 capability. Construct Strategic Weapons Facility at Kings Bay, Georgia. Trident-2 portion of Strategic Weapons Facility at Bangor, Washington. [d]	+$ 99.3 billion
Less cost of missiles plus spares and qualification/training launches for 19th sub. 28 missiles at $26.8 million each, plus $1.0 billion operation & support costs for 28 missiles. [e]	-$ 1.8 billion
Cost of delaying until 2003 the backfit of Trident-2 missiles into the first 8 Trident submarines. [My estimate]	+$ 1.0 billion
R&D to incorporate Trident-2 capability in Trident submarines. [d]	+$ 0.1 billion

[MORE]

Cost to build 10 Trident-2 submarines. Nos. 9 through 18 [f]	+$ 11.6 billion
Military construction of non-SWS facilities and related construction activities at Kings Bay: Trident Training Facility, Trident Refit Facility, Submarine Base. [d]	+$ 1.0 billion
Submarine-related and other non-SWS equipment required for the Trident Training Facility, the Trident Refit Facility, and the Submarine Base at Kings Bay. [d]	+$ 0.8 billion
Estimated operating and support costs for 19 Trident submarines. Includes cost of submarine personnel, operations, and maintenance through the year 2032. [d]	+$ 31.0 billion
Less estimated operating and support cost of the 19th submarine. [My estimate]	-$ 1.0 billion
	==============
TOTAL TRIDENT COST THROUGH THE YEAR 2032	$170.2 billion

SOURCES:

a. CRS-IB73001, *Trident Program*, Congressional Research Service Issue Brief by Jonathan E. Medalia, Foreign Affairs and National Defense Division, updated 22 March 1991, p. 11.

b. My estimate based on GAO/NSIAD-89-40, *Navy Strategic Forces: Trident-2 Proceding Toward Deployment*, US General Accounting Office report, November 1988, p. 31.

c. Does not include DOE costs for nuclear warheads and reactor fuel. Cost of reactor fuel appears to be approximately $51 million per submarine in 1992 dollars (comparing submarine costs on pp. 11 & 12 of CRS-IB73001).

d. GAO/NSIAD-89-40, op. cit., p. 31.

e. Based on CRS-IB73001, op. cit., p. 15 for missile costs, and extrapolating from GAO/NSIAD-89-40, op. cit., p. 31 for operation and support costs. Cost of nuclear warheads furnished by DOE are not included.

f. Calculated from figures given in GAO/NSIAD-89-40, op. cit., p. 31; CRS-IB73001, op. cit., p. 12; and *Department of Defense Authorization for Appropriations for Fiscal Years 1992 and 1993*, transcript of hearings before the Senate Armed Services Committee, Part 2, 1991, p. 164.

APPENDIX D

ESTIMATED TOTAL COST OF BRITISH 4-SUB TRIDENT SYSTEM THROUGH THE YEAR 2032
(Billions of British pounds at 1991-1992 prices)

Following is the estimated complete cost of the British four-submarine Trident system over its 30-year lifetime. It includes the official British government estimate which adds up to 10.518 billion pounds, along with the Greenpeace UK addendum which shows the true price at 33.085 billion pounds.

GOVERNMENT ESTIMATE:	
Submarines (less SWS equipment). [a]	3.810
SWS Equipment. [a]	1.168
SWS Missiles. [a]	0.988
Tactical Weapons System. [a]	0.890
Shore Construction. [a]	1.188
Rosyth Works and Functional Machinery. [a]	0.137
Warhead, Miscellaneous and Unallocated Contingency. [a]	2.337
TOTAL GOVERNMENT COST ESTIMATE (10.676 billion at 1993 prices)	10.518 billion
GREENPEACE UK ADDENDUM:	
Development of PWR-2 submarine nuclear propulsion plant. [b]	0.535
30-year running costs for 4 boats. [b]	11.415
12 refits of the 4-boat fleet at 158 million pounds each. [b]	1.896
Decommissioning costs. [b]	0.077
VLF communications improvements. [b]	0.033
Construction at Faslane Works. [b]	0.397
Clyde Submarine Base externals (roads and services). [b]	0.003
Construction at Coulport Works. [b]	0.001
Construction at Rosyth Works. [b]	0.285
Construction at Works elsewhere. [b]	0.002
Aldermaston Works (warheads, etc.). [b]	1.431
Trident's share of AWE running cost over 30-year life. [b]	6.492
TOTAL GREENPEACE UK ADDENDUM	22.567 billion
TOTAL COST OF TRIDENT PROGRAM	33.085 billion

Sources:

a. HC-337 of Session 1991-92, *Progress of the Trident Programme, The*, Fifth Report of the Defense Committee, House of Commons, 11 March 1992, p. 25.

b. *The Rising Cost of Trident*, Nuclear Free Seas Campaign Report from Greenpeace UK, April 1992, p. 2; and *The True Cost of Trident*, Report from Greenpeace UK, April 1992, p. 5.

APPENDIX E

RESOURCE AND RESEARCH NETWORK
FOR RESISTING TRIDENT

Ainslie, John

c/o Scottish CND
15 Barrland Street
Glasgow G41 1QH, Scotland
(0141) 423-1222 (Voice)
(0141) 423-1231 (FAX)

Background: Administrator of Scottish CND.
Expertise: British Trident submarine.

Babst, Dean

4489 Juneberry Court
Concord, Calif. 94521 USA
(510) 682-6321

Background: Director of accidental nuclear war projectof the Nuclear Age Peace Foundation.
Expertise: Accidental and unauthorized use of nuclear weapons, and nuclear weapons accidents.

Bartells, Wolfgang

In der Schard 8
D-5500 Trier-Zewen, GERMANY
(0651) 86711 or 40046

Background: Television journalist with specialization on public information about military bases.
Expertise: German military bases and using journalism for public education.

Chamberlain, Nigel

Glovers Cottage, Lazonby
Penrith, Cumbria, CA10 1AJ ENGLAND
(01768) 898641

Background: Nukewatch UK coordinator.
Expertise: Nuclear weapons convoys in Britain.

Harine, Kathy, PhD.

2227 "N" Street, #101
Sacramento, California 95186
(916) 448-6746

Background: Doctorate in mathematics and former Lockheed scientist.
Expertise: Nuclear weapons consultant.

McHugh, Declan

c/o Campaign for Nuclear Disarmament
162 Holloway Road
London, N7 8DQ ENGLAND

Background: Editor of "Trust and Verify" for Verification Technology Information Center.
Expertise: British nuclear weapons and treaty verification technology.

Milner, Glen

3227 NE 198th Pl.
Seattle, Washington 98115 USA
(206) 365-7865

Background: Since 1986 an extensive researcher on safety and transportation of weapons by rail. largely through Freedom of Information Act releases.
Expertise: Safety hazards associated with shipment of nuclear weapons and rocket motors by rail.

Peden, William,

Campaign for nuclear Disarmament
162 Holloway Street
London, N7 8DQ ENGLAND
(0171) 700-2393 (Voice)
(0171) 700-2357 (FAX)

Background: Researcher for Greenpeace UK and Campaign for Nuclear Disarmament.
Expertise: British nuclear weapons.

Shannon, Jack

262 Jones Road
Saratoga Springs, NY 12866 USA

Background: Former submarine reactor designer and manager of safety at Knolls Laboratory. Forced out because of an "unacceptable" safety report.
Expertise: Submarine nuclear reactors and their safety.

Smith, Bob
Brandywine Peace Community
P.O. Box 81
Swarthmore, Pennsylvania 19081 USA

Background: Researcher for over ten years on the military contracting activities of General Electric and Martin Marietta.

Expertise: Martin Marietta's contribution to the Trident program both in the US and Britain.

Stuart-Whistler, Bill
620 South Orange Street
Media, Pennsylvania 19063-4012, USA
(215) 565-7806

Background: Former radar engineer for General Electric. Resigned because of GE's military involvement.

Expertise: Radar and electronic sensors.

Urfer, Bonnie
P.O. Box 2658
Madison, Wisconsin 63701-2658 USA
(608) 767-3023

Background: Nukewatch USA coordinator.

Expertise: Transportation of nuclear weapons/materials on US highways.

Willis, Patti
Pacific Campaign for Disarmament and Security
Chickadee Lane Farm
Denman Island, B.C.
VOR 1TO CANADA
(604) 335-0351

Background: Research Coordinator for Pacific Campaign for Disarmament and Security. Publishesperiodic "Information Update."

Expertise: Militarism in the Pacific area and its effect on indigenous people.

Plesch, Daniel P.
British American Security Information Council
Carrara House
20 Embankment Place
London, WC2N 6NN ENGLAND
(0171) 925-0862 (Voice)
(0171) 925-0861 (FAX)

Background: Director of BASIC. Publishes periodic short "BASIC Reports" for updates on current events and negotiations. Also publishes periodic comprehensive papers on specific subjects.

Expertise: Weapons in Britain and Europe, particularly nuclear weapons. Treaty negotiation status and details.

APPENDIX F

PUBLICATIONS TO HELP THE NETWORK FOR RESISTING TRIDENT

BASIC Reports
British American Security Information Council
Carrara House
20 Embankment Place
London WC2N 6NN ENGLAND
(071) 925-0862 (Voice)
(071) 925-0861 (FAX)
or
1900 "L" Street, NW; Suite 401-2
Washington, D.C. 20036, USA
(202) 785-1266 (Voice)
(202) 387-6298 (FAX)

Campaign
Campaign for Nuclear Disarmament
162 Holloway Road
London N7 8DQ ENGLAND
(071) 700-2393

Damocles in Brief (English language)
Center for Documentation and Research on Peace and Conflicts
B.P. 1027
69201 Lyon Cedex 01, France
(33) 78 36 93 03 (Voice)
(33) 78 36 36 83 (FAX)

From Trident To Life Newsletter
c/o CALC
340 Mead Road
Decatur, Georgia 30030 USA

Heddwch Action News
CND Cymru (Wales)
c/o Peace Shop
56 Mackintosh Place, Roath
Cardiff, CF2 4RQ WALES
(0222) 489260

Nuclear Free Local Authorities Bulletin
National Steering Committee
The Planning & Environmental Health Department
Town Hall
Manchester M60 2LA, ENGLAND

Nuclear Free Scotland
Scottish CND
15 Barrland Street
Glasgow, G41 1QH, SCOTLAND
(041) 423-1222 (Voice)
(041) 423-1231 (FAX)

Nukewatch Pathfinder
P.O. Box 2658
Madison, Wisconsin 53701-2658 USA
(608) 767-3023

Nukewatch Newsletter
c/o Nigel Chamberlain
Glover's Cottage, Laxonby
Penrith CA10 1AJ, England

Peace Work
A New England Peace and Social Justice Newsletter
American Friends Service Committee
2161 Massachusetts Avenue
Cambridge, MA 02104 USA
(617) 661-2832

Positive Alternatives
The Center for Economic Conversion
222 View Street, Suite C
Mountain View, California 94041 USA
(415) 968-8798

Space and Security News
5115 South A1A Highway
Melbourne Beach, Florida 32951 USA
(407) 952-0600

APPENDIX G

THE START TREATIES

Two landmark events took place during 1992 which set the stage for significant reductions in strategic nuclear weapons -- i.e. cuts in intercontinental ballistic missiles (ICBMs), submarine-launched ballistic missiles (SLBMs), and long-range bombers. A joint understanding between the US and Russia regarding a START-2 Treaty (the so-called Bush-Yeltsin Agreement) was signed on 17 June 1992, and the START-1 Treaty was ratified by the US Senate on 1 October 1992. Although the terms and status of these two treaties are vaguely understood, a working knowledge by the general public seems to be lacking.

A. START-1

The first Strategic Arms Reduction Talks (START-1, or sometimes simply START) Treaty was signed by US President George Bush and Soviet President Mikhail Gorbachev on 31 July 1991. But on 25 December 1991 the Soviet Union ceased to exist. Soviet strategic nuclear weapons were then located in four of the successor states -- Russia, Ukraine, Kazakhstan, and Belarus.

On 23 May 1992 these four states, now members of the Commonwealth of Independent States (CIS), signed an agreement with the US in which all five become parties to the SALT-1 Treaty. That protocol provides that:

-- the four new CIS states will decide among themselves how to implement their responsibilities under START-1.

-- Ukraine, Kazakhstan, and Belarus committed themselves to joining the Nuclear Nonproliferation Treaty (NPT) as non-nuclear states. This means they will give up their nuclear weapons.

-- Russia remains a nuclear state party to the NPT.

1. Terms of the START-1 Treaty.

After the legislatures of all five parties ratify START-1 and instruments of ratification are exchanged, the treaty will go into effect. Reductions must then be completed in three phases over a period of seven years. The treaty is of 15 years duration unless abrogated earlier, and may be renewed in five year increments.

In general, START-1 covers "deployed" strategic nuclear delivery vehicles (SNDVs) and warheads. It does not mandate destruction. SNDVs and warheads can be removed from deployment by removing the launchers. The basic START-1 limits are:

1600 SNDVs which carry no more than

6000 "accountable" nuclear warheads, of which only 4900 can be on ballistic missiles.

1540 maximum on heavy ICBMs (SS-18s).

1100 maximum on mobile ICBMs.

A major obstacle during negotiations was how to count nuclear sea-launched cruise missiles (SLCMs), which the US insists are tactical weapons, not long-range strategic weapons. This was solved by a political statement (a gentlemen's agreement) that neither country will build more than 880. The US only planned on 750 anyway. But this agreement is separate from START and does not count against the SNDV and warhead ceilings.

Another stumbling block was how to count warheads on bombers. This led to a formula for "accountable" nuclear warheads. Each bomber carrying only gravity bombs or short-range attack missiles (SRAMs) will be counted as one SNDV with only one warhead, regardless of the number of bombs and SRAMs it can carry. For bombers carrying air-launched cruise missiles (ALCMs), the first 150 of such US bombers are counted as carrying only ten warheads each, although they can carry twenty. The first 210 of such Soviet bombers are counted as having eight warheads each, although they can carry up to twelve. Above these numbers (150 and 210) the actual number of warheads on each bomber are counted. So, although there are only 6000 "accountable" warheads allowed under START, the actual number of strategic warheads could be as follows:

	US	USSR
On SLBMs	3456	1872
On ICBMs	1444	3028
Bombs/SRAMs	2720	960
ALCMs	1860	1300
Total W/Hs on 1600 SNDVs	9480	7160
Total W/Hs with 880 SLCMs	10360	8040

2. *Status of the START-1 Treaty.*

By a vote of 93-6 the US Senate on 1 October 1992 ratified the START-1 Treaty. Kazakhstan had already ratified START-1 and Russia followed suit on 4 November 1992. Belarus ratified on 2 February 1993. Although Ukraine started removing its missiles and warheads earlier, it completed the ratification process for START-1 in December 1994. START-1 is now in effect and dismantling to comply with its limits must be completed by the end of 2001.

B. START-2

During the 17 June 1992 Washington Summit, Presidents Bush and Yeltsin signed a Memorandum of Joint Understanding, commonly called the Bush-Yeltsin Agreement. The Joint Understanding agreed to cut strategic warheads considerably below START-1 ceilings -- to between 3,000 and 3,500 on each side by 2003. (Russia plans 3,000 and the US 3,500). Deployed Trident warheads allowed will be halved from the possible 3,456 to 1,728.

The START-2 Treaty was signed by Presidents Bush and Yeltsin on 3 January 1993. It codified the Joint Understanding and may not enter into force before START-1, but shall remain in force as long as START-1. All of the START-1 provisions apply except as specifically modified by START-2. Like START-1, START-2 limits only deployment of SNDVs and warheads -- it does not restrict the stockpile -- except for the SS-18 heavy ICBM.

1. Terms of the START-2 Treaty.

The concept of "accountable" warheads has been removed by START-2. SLCMs, however, are still not covered. START-2 is to be implemented in two phases.

a. Phase-1 Reductions. The first phase is completion of START-1 reductions seven years after that treaty enters into force. Only the US and Russia are parties to START-2 because Ukraine, Kazakhstan, and Belarus will have disposed of their strategic weapons by the end of this phase. The START-1 reductions for this phase have been further modified by START-2:

- 1600 SNDVs (same as START-1)
- 3800-4250 "actual" warheads (rather than 6000 "accountable"); with sub-ceilings of:
  - 2160 maximum SLBM warheads (new limit).
  - 1200 maximum MIRVed ICBMs (new limit).
  - 650 maximum on heavy ICBMs (rather than 1540).
  - 1100 maximum on mobile ICBMs (same as START-1).

b. Phase-2 Reductions. Phase 2 is the completion of START-2 reductions by 2003 -- or by the end of the year 2000 if the US can help Russia finance elimination of its strategic weapons. The final limits are:

- 1600 SNDVs (same as Phase-1/START-1)
- 3000-3500 "actual" warheads; with sub-ceilings of:
  - 1700-1750 maximum SLBM warheads (may be MIRVed).
  - 1100 maximum mobile ICBM warheads (same as Phase-1/START-1).
  - Zero MIRVed ICBM warheads (only one warhead allowed on each ICBM).
  - Zero heavy ICBM warheads (SS-18s entirely eliminated).

c. Warhead Downloading Rules. The number of warheads that can be taken off of a missile to meet treaty requirements is limited. Only two types of missiles for both countries, in addition to the US Minuteman-3 ICBM and the Russian SS-N-18 SLBM, may be downloaded by up to four warheads each. There is no limit on the aggregate number of warheads downloaded as long as no more than four come from each missile.

An exception to this rule was made so that Russia would not have to build new missiles. Since each SS-19 carries six warheads, five would have to be downloaded to make it a single-warhead (non-MIRVed) missile. Therefore, a maximum of 105 SS-19s can substituted for one of the two missile types specified for downloading. Each ICBM may only be deployed in its existing silo.

Under these downloading rules, all US Minuteman-3 ICBMs (now three MIRVs each), all Russian SS-17 ICBMs (now four MIRVs each), and 105 Russian SS-19 ICBMs may be downloaded to single-warhead missiles. The new Russian SS-25 is already a single-warhead ICBM.

If the SS-18 weren't eliminated as a heavy ICBM, nine of its ten MIRVs would have to be downloaded to become a single-warhead missile. That exceeds the downloading rule so it would have been eliminated anyway. By that same token, the US MX ICBM and

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