Structural Fires

Definition Uncontrolled burning in resident&l, commercial, industrial or other properties in rural or developed areas

National Frequency During the period 1983-1988, there were 2,300,000 fires reported in the United States annually.

Regions at Risk All areas are at risk to personal injury or property damage due to fire.

Season(s) Year round, with the residential fire rate in January being twice that of the summer months

Effects During 1983-1988, there was an average of 5,900 civilian fire deaths, 29,000 civilian injuries, and $7.8 billion (1988 dollars) in losses from fire reported each year. In 1988, there were 6,215 deaths-an upward trend of 5 percent.

Worst Event The largest number of lives lost in an urban structural fire occurred at the Iroquois Theater in Chicago in 1903 where 602 persons died. The "Chicago Fire" of 1871, which killed 230 people, burned 17,450 buildings and caused damages of $196 million, ranks as one of the worst urban fires in the country's history.

Discussion According to the FEMA United States Fire Administration (USFA), the fire problem in the United States is of major proportions and, comparatively, is one of the worst in the world in terms of relative populations. As reported by the United Nations World Health Organization in 1983, the United States, with 27 fire deaths per million persons per year, had the third highest ranking of the countries for which statistics were available. Only Scotland (32 deaths per million) and Canada (31 deaths per million) ranked higher. Nations reporting the lowest number of deaths included Germany/Spain (each with nine deaths per million), Italy (with seven deaths per million) and Switzerland (with five deaths per million).

Fire fatalities tend to be distributed according to population density, i.e., those States with the largest populations tend also to have the greatest number of fire fatalities. For example, ten States, which accounted for 52 ***percent*** of the 5,514 recorded fires for 1987, reported the following fire-fatalities: New York (465), Texas

(358), Illinois (335), California (307), Pennsylvania (284), Ohio (265), Michigan (249), Florida (211) North Carolina (210) and Georgia (190). The complete listing of States is included in *Figure* 24. (Note that Colorado is not listed because the inclusion of the 6 fire-related deaths in Denver, the only jurisdiction in the State that provides fire statistics, would distort the national picture.) While it is useful to know by State where the greatest number of

STATE FIRE DEATHS RECORDED IN 1987

Using Absolute Measures [1]

The following States account for close to 52% (2,874) of fall recorded fii deaths nationally:

New York (465)	Obb (265)
Texas (358)	Michigan (249)
Illinois (335)	Florida (211)
California (307)	North Carolina (210)
Pennsylvania (284)	Georgia (190)

The next 10 States account for an additional 26% (1,437) of all national fire deaths:

Alabama (175)	Louisiana (137)
New Jersey (173)	Mississippi (134)
South Carolina (168)	Indiana (130)
V l l (143)	Maryland (126)
Tennessee (140)	Wisconsin (111)

The remaining 30 States account for the remaining 22% (1,203) of the national fire deaths [2]:

Missouri (110)	Washington (50)	New Hampshire (26)	North Dakota (12)
Massachusetts (99)	Oregon (48)	Rhode Island (23)	Nevada (10)
Oklahoma (92)	Connecticut (47)	Delaware (22)	Washington, DC (10)
Arkansas (83)	Minnesota (42)	Alaska (22)	Vermont (9)
Kentucky (82)	Arizona (41)	Montana (21)	Hawaii (8)
West Virginia (77)	Maine (37)	Nebraska (19)	Idaho (7)
Kansas (72)	Utah (29)	South Dakota (16)	Wyoming (7)
Iowa (54)	New Mexico (28)		

Source: State Fire Marshall Offices and USIA

1 95% (5,514) of the estimated 5,800 fire deaths.
2 Colorado omitted - incomplete data

Figure 24

fire deaths occur, it is perhaps even more useful to know in which States people face the greatest *personal risk* of death by fire. As the map in *Figure* 25 illustrates in the checkered pattern, the areas with the worst fire death rates per million population during 1987 were the Southeast and the States of Alaska, Maine, West Virginia and Delaware. The five States with the highest death rates per million were Mississippi (51.0), South Carolina (49.1), Alabama (42.9), Alaska (42.9) and West Virginia (40.6). For the past 15 years, the Southeast and Alaska have ranked consistently in the highest fire death category. While the States in the vertical and diagonal striped areas of the map have lower death rates than those in the checkered areas, they have fire death rates higher than most of the developed nations in Europe and the Far East. *Any one of these States would have the highest or the second highesf death rate in the world if if were a separate country.*

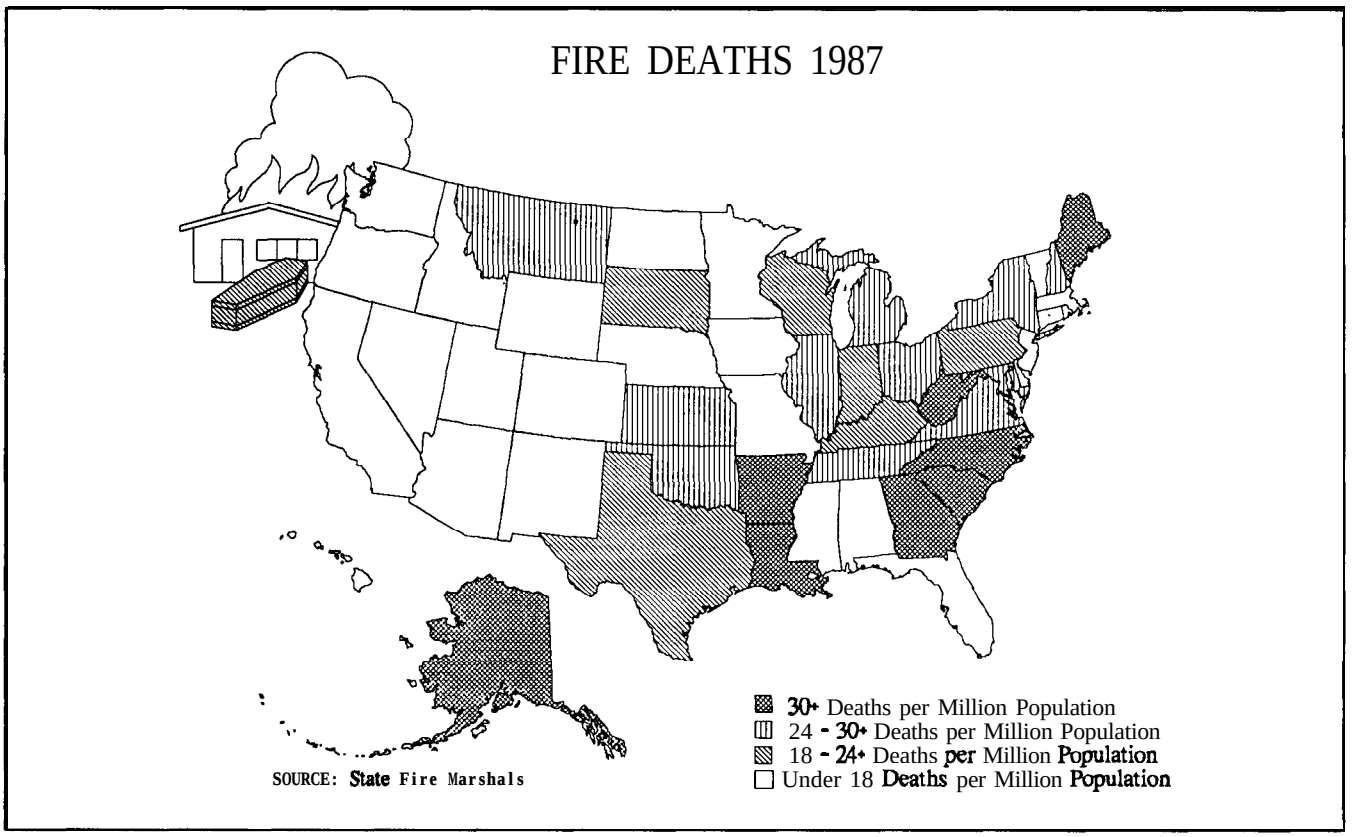


Figure 25

The unshaded "best" States, generally in the Southwest, West and Mountain States, have fire death rates that compare with European and Far East nations. The four States with the lowest deaths per million for 1987 were Nevada and Minnesota (9.9 each), Hawaii (7.4) and Idaho (7.0). (Colorado, which was excluded because of incomplete data, probably ranks among the low death rate States also.) California's death rate was the lowest of the highly populated States. (Source: ***Fire in the United States: 1983—1987, and Highlights for*** *1988. pp. 37-41. Federal Emergency Management Agency, United States Fire Administration.)*

Telecommunications Failure

Definition

The failure of data transfer, communications or processing brought about by: 1) physical destruction of computers or communications equipment, or 2) a performance failure of software needed to run such equipment, either through bad design or sabotage.

National Frequency

Standards for reporting telecommunications failures are still being established. Since the beginning of 1990, there have been at least three major disruptions of long distance telephone service reported. In the summer of 1991, there were also a number of regional failures in telephone communications. In the matter of computers and computer networks, attacks against them have started to become common in the past two years, but there is no formal list of reported attacks.

Effects

Because of the dependence of firms and organizations on electronic access to data and the need to rely on computers to manage complex operating systems, any telecommunications failure can bring significant costs. The consequences of a telecommunications failure include:

- The reduction in, or perhaps complete termination of, business functions.
- A loss in business revenues.
- Increases in the cost of doing business.
- Intangible costs entailed in the loss of business image and customers, or even the possibility of making legal or regulatory violations as a result of the failure.

There are a number of examples of how the single fact of a telecommunications failure can lead to far-reaching effects. In November 1985, a computer problem at the offices of the Bank of New York prevented it from completing an exchange of government securities. This not only cost the bank **$1.5** million after taxes, but the delay forced the bank to borrow $24 billion from the Federal Reserve System. The long-distance telephone failure that occurred in New York on September 17, 1991 led air traffic controllers at Newark, LaGuardia and JFK airport to halt flights, resulting in cancellation of 458 flights and affecting 31,000 passengers.

Worst Event

Definitive data are not available. However, among the most significant were the long-distance failure of January 16, 1990, when AT&T lost an estimated $75 million in revenue just from an inability to place calls. The costs in lost commerce from the nine-hour loss of service is assumed to reach hundreds of millions of dollars. The most disruptive computer attack was the Internet Worm in November 1988, which within a few hours had infected 6,200 research and government computers, including one at the Lawrence Livermore National Laboratory.

Discussion

Telecommunications hardware is not only subject to physical threats like flood and fire, but also to a number of electronic threats. Lightning can damage telecommunications equipment either through conduction of its direct current or an induced current from coupling or electromagnetic radiation, typically delivered through power lines. There are other sources of electromagnetic radiation like radars, radio and television broadcast antennas, motors, generators, arc welders, nuclear bursts and even other computers. Electrostatic discharge, a personal irritant on dry winter days to most people, can be devastating to electronic equipment. A measure of the potential problem is the estimate that the electronics industry suffers losses of up to $5 billion annually in both direct and indirect costs arising from the effects of electrostatic discharge on equipment reliability.

Computer software is another source of telecommunications failure. A number of the disruptions in long-distance and regional phone service was caused by installation of new, inadequately tested computer software packages. Weaknesses in software security also allow vandals, criminals and terrorists to gain access to important computer databases and control systems.

As the operation of modem society becomes more dependent on computerized databases and instant communications at intercontinental distances, a failure of telecommunications will have a much more devastating effect. Once electronic systems have been established in an organization, it becomes almost impossible to make a temporary return to manual procedures when systems fail. And there are trends that make the possibility of telecommunications failures much more common than they were in the past, including:

- Technological developments have allowed communications links to carry much more traffic on fewer lines. Network switches have also grown smaller while they increase their capacity. Both trends could limit the ability of

the country to recover from a telecommunications failure. This reduction in the number of telecommunications links limits the number of alternative routes that could be used if one should fail. A trend towards greater centralization of communications switches will mean that the physical destruction of one center will cause more disruption than those of the past.

- While the introduction of more competition into the communications industry over the past decade has some benefits for the nation, there are also potential drawbacks. Different vendors frequently rely on incompatible operating systems, thus preventing one from serving as a backup for another. There is also the fact that the increased competition for telecommunications services based on lowest price diminishes the ability of vendors to spend more money on tight security.
- The development of firms establishing their own telecommunications networks could cause problems. Private telecommunications networks may not have the same degree of redundancy and security that the earlier national system had. Private telephone links are more likely to rely on the vagaries of commercial power, unlike the monopoly phone system of the past. Private networks will also rely more on standard "open" software systems that are more vulnerable to computer attack.
- Finally, as computer software becomes more complex, the likelihood of software bugs appearing in new software programs for telecommunications operations increases.

The vulnerability of the society to some form of telecommunications failure is inevitable. As the National Research Council notes: *"It is impossible to build systems that are guaranteed to be invulnerable to a high-grade threat, that is, a dedicated and resourceful adversa y capable of and motivated to organize an attack as an industrial rather than an individual or small group enterprise."* Still, there is a considerable amount of work currently going on to establish security standards, as in the Defense Department's *Trusted Computer Systern Evaluation Criteria,* and the development of Computer Emergency Response Teams to deal with the consequences of telecommunications failure.

Transportation Accidents

Definition

An incident involving air or rail travel resulting in death or injury

National Frequency

According to the National Transportation Safety Board, the scheduled airline accident rate per 1~0,000 departures in 1990 was 0.331, slightly higher than the 0.328 rate in 1989. The fatal accident rate, however, fell from 0.109 to 0.083. There were a total of 2,282 accidents and 819 deaths for all categories of aviation--a decline from the previous year. The 1990 accident rates for both commuter air carriers and general aviation were the lowest ever recorded by the Safety Board.

Accident reports maintained by the Federal Railroad Administration reveal that, during the years of 1984-1989, there were 18,869 train accidents. The annual average for that 6-year period was 3,145 or 5.33 accidents per million train-miles. The number of fatalities totaled 391, for an annual average of 65. In 1989, the 3,080 recorded accidents were below the annual average, but the 87 deaths were above the average and the highest in the last 6 years. Damage estimates from the train accidents in 1989 were over $212 million. The greatest number of accidents (328) occurred in Illinois-see *Figure 26.*

Regions at Risk

All areas of the country are at risk to transportation incidents. Risk areas would be around airports with Federal Aviation Administration control towers or with traffic flow heavy enough to pose a hazard and passenger rail lines. The greatest risk involves those local jurisdictions with airports, rail lines and major highway systems.

Season(s)

Year round

Effects

Effects can include loss of life, associated property losses and fire.

Worst Event

This accident occurred on May 25, 1979, at Chicago's O'Hare Airport when an American Airlines DC-10 lost its left engine upon take-off and crashed seconds later, killing all 272 people aboard and 3 on the ground.

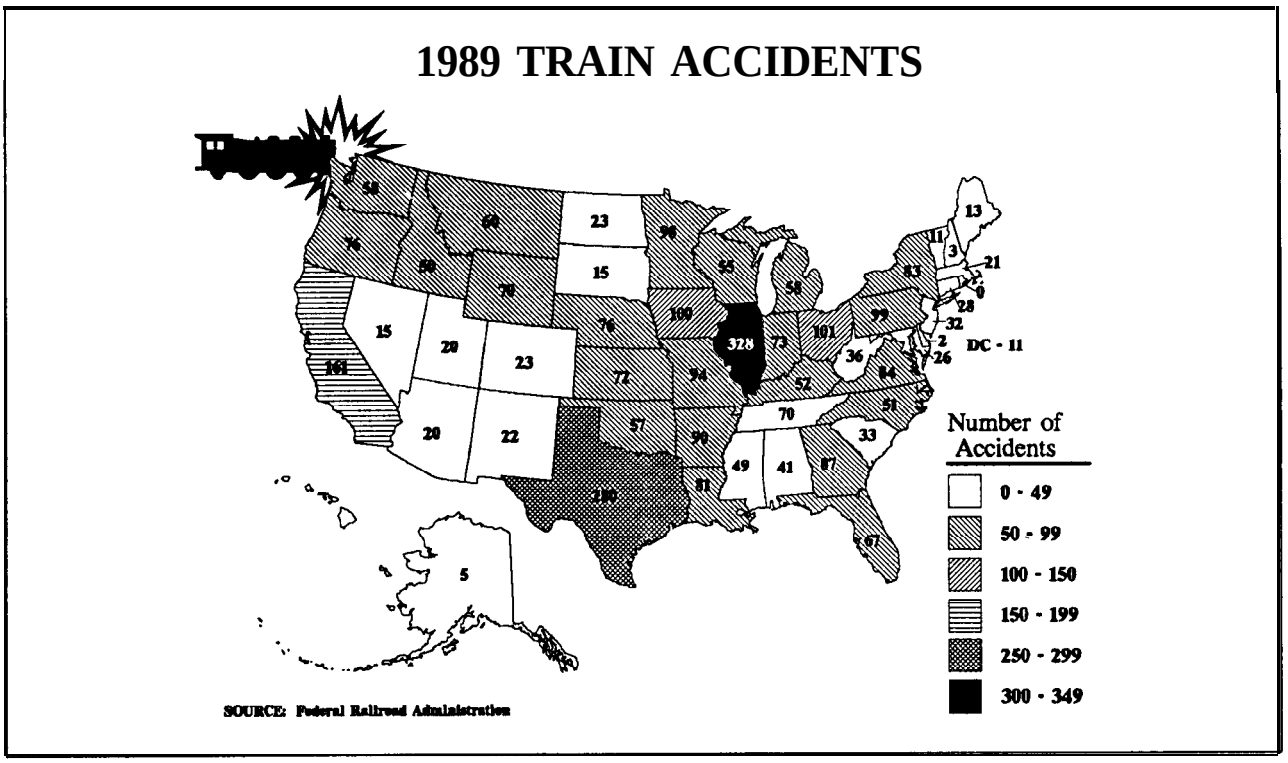


Figure 26

Discussion

There are two circumstances in air transport which trigger a disaster response: an airliner crashing in a populated area, such as happened over Cerritos, California, in 1986 as the result of a collision with a private aircraft and a takeoff or landing accident such as occurred in Washington, D.C., in 1982 and Sioux City, Iowa, in 1989.

Apart from the actual rescue operations, the Washington, D.C., crash highlighted two problems. First, there was a multi-jurisdictional response and a lack of coordination capability, even to the extent there were no common radio frequencies for communications. Second, while this rescue operation was underway, there was another fatal accident involving a subway train which placed an added severe strain on the District of Columbia's disaster response resources.

In terms of loss of life, there have been two serious railroad accidents in the past 20 years. The first was in Chicago in 1972 when one commuter train plowed into the back of another, causing 45 deaths and over 200 injuries. (A saving factor can be attributed to the location of the accident-in the backyard of a major hospital

which had participated in a disaster drill the preceding day.) The second occurred in Chase, Maryland, in 1987 when a train derailment resulted in the death of 16 people.

NATIONAL SECURITY THREATS

National security threats are those threats that primarily come from actions by external, hostile forces against the land, population or infrastructure of the United States. A formal estimate of the security threat to the nation is the responsibility of intelligence agencies using classified sources of information. Statements in this report should not be construed as such an estimate. FEMA has used information in open, unclassified sources to outline how changes in the world situation could affect State and local emergency management. The potential for damage resulting from national security emergencies ranges from the relatively localized damage caused by a terrorist attack to the catastrophe that might occur following an attack on the United States by foreign military forces using chemical, biological or nuclear weapons. National security threats include ballistic missile attack, chemical and biological attack, civil disorder, and nuclear attack along with terrorism. (While terrorism is not a form of attack like the other national security threats, it does represent an important national security threat that encompasses a number of different attack threats.)

Ballistic Missile Attack

Definition Attack by "any missile which does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated." (JCS Publication 1, Dictionary of Military and Associated Terms) Ballistic missiles are divided into the classes of short-range (less than 600 nautical miles), medium-range (600 to 1500 miles), intermediate-range (1500 to 3000 miles), and intercontinental (3,000 to 8,000 miles) missiles.

National Frequency No domestic incident has occurred. Ballistic missiles have been used against U.S. interests abroad.

Regions at Risk All areas of the U.S. are potentially at risk from those nations with an intercontinental ballistic missile capability and a hostile intent to use them.

Season(s) An attack could occur at any time of the year,

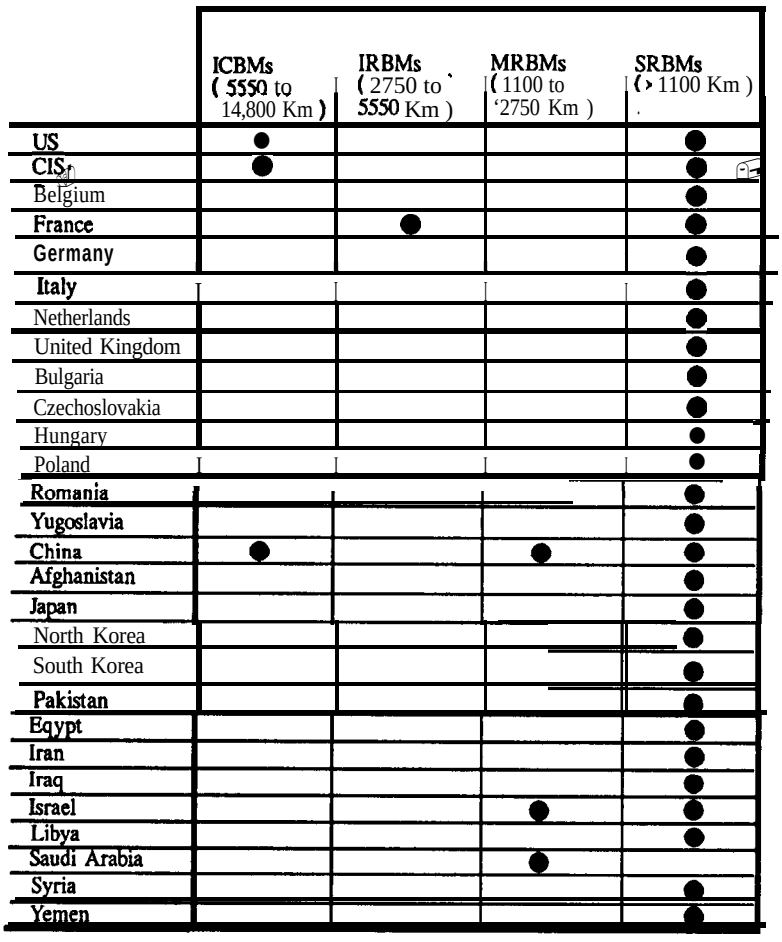
Effects While most ballistic missiles have limited payloads, the force that accumulates from their travel can still lead to considerable destruction of military targets and urban areas. The addition of chemical, biological or nuclear warheads to ballistic missiles can make their use even more devastating.

Discussion In the past, the use of ballistic missiles was largely associated with nuclear attack. In recent years, however, the worldwide proliferation of ballistic missiles led it to become an issue in conventional warfare. Libya fired missiles at the Mediterranean US military base at Lampedusa in 1986. Iraq's dramatic use of the Scud (a direct descendant of the World War II era V-2 missile) in the 1991 Gulf War led to a number of American military deaths. Iraq's use of its Scud missiles has also provided a lesson to other small nations in the relative ease of use and concealment capabilities of ballistic missiles.

Figure 27 lists the nations that currently have some sort of missile capability. Few, besides the declared nuclear powers, currently have the capability to send missiles that can reach US territory. Still as military analyst Edward N. Luttwak notes: *"a county that can manufacture missiles with a range* of *say, 300 kilometers will not generally encounter great difficulties in producing ballistic missiles with a range of 600 kilometers and may well be able to acquire missiles with a range of 6,000 kilometers -*

Land-Based Surface to Surface Missile Inventories

(Excludes Coastal Defense Forces)



Source: The Military Balance 1991-1992

Figure 27

without having to overcome the enormous barriers, both political and operational, that constitute such a secure fire wall between tactical and strategic airpower." In any event, a number of nations already have, or will soon get, the ability to reach the territory of US allies in Europe, the Middle East and Asia.

There have been efforts to restrict the proliferation of missile technology through the establishment of the Missile Technology Control Regime. There is enough indigenous technical capability in the Third World, however, to ensure that some will try to develop intercontinental missiles over the next decade to reach the US.

A more ominous missile threat could come from the move to develop air-breathing cruise missiles. Cruise missiles could offer Third World countries a cheaper and more flexible alternative to the acquisition of ballistic missiles. If the terrain data needed by cruise missiles became easily available through commercial geographic information firms, the major obstacle to the widespread development of cruise missiles would be eliminated.

Chemical and Biological Attack

Definition The introduction of toxic or infective agents to harm an enemy's population and animal or plant food resources

National Frequency No U.S. occurrence. However, with the continued development of chemical and biological weapons and with improved delivery systems by Third World nations, the threat could increase in the future.

Regions at Risk Nationwide

Season(s) Although deployment can be affected by climatic conditions, an incident could occur at any time of the year.

Effects The nature of this attack threat falls into three categories: chemical agents, biological agents and toxins.

Chemical. Chemical weapons, including warheads on missiles, contain liquid or gaseous chemical agents that cause toxic damage to living tissue rather than the usual injuries that result from other physical effects **such** as blast, heat or shrapnel. Although chemical agents do little damage to buildings or vehicles, long-lasting chemical agents placed in structures or whole areas can render these locations useless for humans or animals.

There are four general types of chemical agents available for use as weapons that cause serious injury or death through inhalation or body surface contact: (1) blister agents--general tissue irritants such as mustard gas that can burn or blister the skin or the lung tissue if inhaled; (2) blood gases-gents such as hydrogen cyanide that interfere with cell respiration after entering the blood circulation through the lungs; (3) lung irritants--choking agents such as phosgene that irritate and damage lung tissue and (4) nerve agents—chemicals such as tabun, sarin and soman that interfere with the transmission of nerve impulses and disrupt vital bodily functions such as breathing.

Biological. Biological weapons contain living organisms that can cause disease or death; however, the success or effectiveness of a biological agent is directly related to its ability to reproduce in the organism attacked. The preferred biological weapons involve the use of bacterial agents such as *Bacillus anthracis*—anthrax—the spores of which can remain active in soil for years.

The lethal potential of these weapons has been increased recently by advances made in genetic engineering and biotechnology. Normally harmless, non-disease producing microorganisms can now be modified to become highly toxic or to produce diseases for which an opponent has no known treatment or vaccine. In other cases, disease agents which had been considered too unstable for storage or warfare applications can now be modified by genetic engineering and used as biological agents for warfare.

Toxins. A variant on the biological agents are the toxins. Derived from the growth of living cultures, the toxins have the advantages of being much more deadly by weight than chemical weapons and have a greater stability in handling compared to biological weapons. Botulinal toxic is produced from *Clostridium botulinum,* a common problem resulting from bad food processing. Ricin, obtained from the castor bean, was used in the noted assassination of Bulgarian defector Georgi Markov in London in 1979.

Discussion

The threat from chemical and biological weapons could be a major problem because the agents require little sophistication and are much cheaper to manufacture than nuclear weapons. The technology and expertise required to produce chemical warfare agents are very similar to those common in the petrochemical, pharmaceutical, fertilizer and insecticide industries. The chemicals would likely be made in newly dedicated production units since new construction is easier than conversion of existing factories. However, the conversion of existing facilities for chemical and biological weapons production does have the advantage of reducing the likelihood of detection. These facilities can be built and operated to produce large quantities of the agents from widely available chemical compounds using relatively simple processing techniques. Any country with a modest amount of technical expertise that produces and refines petroleum could make mustard gas, for example, without importing any chemicals. Conversely, the production of nerve gas would require a greater challenge because of the requirement for large quantities of raw materials.

As for biological agents, the Office of Technology Assessment notes that: "*Some biological weapons technology is available, in principle, to any nation that can brew beer.*" In the February 9, 1989, Senate Hearing on Global Spread of Chemical and Biological Weapons, Director William H. Webster of the Central Intelligence Agency told the Committee members that biological agents are more potent than chemical agents and can deliver the broadest area of coverage per payload pound of all

weapon systems. A variety of means such as missiles, tube and rocket artillery, bombs, vectors (insects) or human agents can deliver and disseminate biological agents.

The potential for use of these agents by terrorists is high. For example, a raid on a German terrorist safehouse in Paris uncovered numerous documents for manufacturing bacterial cultures, with flasks containing *Clostridium botulinum* found in the bathroom. There have also been reports of individuals attempting to obtain biological and toxic agents from commercial sources.

Defense against chemical and biological attacks requires a combination of early detection and diagnosis of injuries caused by an attack, an ability to evacuate endangered individuals, appropriate vaccines for preventing the spread of infectious biological agents, antibiotics and antidotes for treatment of casualties, and the development of means to protect and decontaminate areas of attack.

Civil Disorder

Definition Any incident, the intent of which is to disrupt a community to the degree that police intervention is required to maintain public safety. Terrorist attacks, riots, strikes that lead to violence and demonstrations resulting in police intervention and arrests are included in this category.

National Frequency Undetermined

Regions at Risk Nationwide

Season(s) Civil disorders may occur at any time but are more frequent during the summer months.

Effects The effects of this threat can vary based upon the type of event and its severity and range. Loss of life and property as well as disruptions in services such as electricity, water supply, public transportation, communications, etc., could result from civil disorder. Certain types of facilities are more vulnerable than others during civil disorders. These include Federal, State and local government buildings, universities, military bases, abortion clinics, nuclear power facilities and correctional facilities.

Discussion Civil disorders are a form of collective violence interfering with the peace, security, and normal functioning of the community. They are public in character even though, like institutional disorders, they may take place in a restricted setting. Although on occasion they begin with surprising suddenness and develop with alarming speed and intensity, mass disorders are always outgrowths of their particular social context. Indications of such occurrences, though often ignored at the time, can be clearly detected by hindsight. Civil disorders can develop out of legitimate expressions of protest, lawfully organized and conducted. Many such are symptomatic of deep-seated tensions in community relationships; when a precipitating event occurs, these tensions erupt into violence. The immediate, official response to disorder must be to restore order and permit the normal functioning of the community; only a long-range strategy can remove the root causes of disorder and ensure that it will not recur when emergency constraints have been lifted.

Compared to the situation in the 1960s, the number of riots and violent demonstrations that have occurred in the US has been low. However, every year there are incidents at political demonstrations and special public events which tax the capabilities of local law enforcement organizations. Local communities should plan on establishing links with State and Federal sources of support in case of overwhelming crisis.

Nuclear Attack

Definition Any hostile action taken against the United States by foreign forces which results in destruction of military and/or civilian targets through use of nuclear weapons, including the blast, fallout and electromagnetic pulse effects from such an attack.

National Frequency NO U.S. occurrence.

Regions at Risk Any area of the U.S. is potentially at risk from either direct blast effects or secondary effects from fire or radioactive fallout.

Season(s) An attack could occur at any time of the year.

Effects The effects of a nuclear attack, even one limited to just a few targets in the US, would be catastrophic and far reaching. Millions of lives could be at risk to the effects of blast overpressure, fire, direct radiation and radioactive fallout. The loss of property and infrastructure would be catastrophic with an almost incalculable associated dollar value, causing national repercussions far beyond the limited area directly affected.

Discussion The report's Introduction discussed the changing nature of the nuclear attack threat to the United States. While the likelihood of a massive, coordinated attack from the republics of the Commonwealth of Independent States (CIS) which succeeded the Soviet Union has diminished, a more limited nuclear attack threat still remains. *Figure* 28 lists estimates of the nuclear arsenals of the world's declared nuclear powers. The chart lists the nuclear-capable republics of the CIS separately, since the details of their planned centralized control have not been completed. Looking at the list, it is clear that while most of these nuclear arsenals are much smaller than that of the US, there are several that could inflict significant damage on the country through a strategic nuclear attack.

One estimate of the potential damage was made in a study by William Daugherty, Barbara Levi and Frank von Hipple. Assuming an attack of 100 one-megaton warheads, the study gave four potential scenarios for targeting: 1) a "worst case" attack on US cities attempting to maximize the number of casualties, 2) a 100 warhead attack on the 100 largest US cities, 3) an attack designed to damage the military and industrial capability of the US, and 4) an attack aimed at US strategic

Estimated Nuclear Delivery Systems — 1990

	ICBMs	SLBMs	Bombers
Russia	1067	62	22
Ukraine	176		34
Kazhkstan	104		40
Belarus	54		
France	18	%	173
China	100	24	140
Britain		64	148

Source: The Bulletin of the Atomic Scientists Nuclear Notebook

Figure 28

nuclear facilities. Despite the fact that the attack scenarios involve just a fraction of existing nuclear weapons inventories, the study revealed that such "limited" attacks would kill tens of millions of Americans. *Figure* 29 gives the estimates of deaths and total casualties from either direct blast (overpressure) or the fires resulting from a nuclear attack (conflagration) for each scenario.

Estimated Deaths and Total Casualties from the "100 Megaton" Attacks

Model:	Deaths (millions) Overpressure --> Conflagration	Total Casualties (millions) Overpressure --> Conflagration
Attack		
Worst-Case	25-66	36-7 1
City-Centers	14--42	32-51
Military-Industrial	11–29	23-35
Strategic-Nuclear	3-11	10--16

Figure 29

Apart from the declared nuclear powers, there is a concern about the potential for proliferation of nuclear weapons. CIA Director Robert Gates, in his January 14, 1992 testimony before the Senate Government Affairs Committee stated that: *"Today over* 20 countries *have, are suspected of having, or are developing nuclear, biological or chemical weapons and the means to deliver them."* The discovery of the extent of the nuclear program of Iraq, a signatory to the Nuclear Non-Proliferation Treaty subject to standard international inspection of its nuclear activities, is a reminder of the potential danger from the spread of nuclear weapons technologies.

Terrorism

Definition

Terrorism is the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives.

The FBI categorizes two types of terrorism in the United States:

- ***Domestic terrorism*** involves groups or individuals whose terrorist activities are directed at elements of our government or population without foreign direction.
- ***International terrorism*** involves terrorist activity committed by groups or individuals who are foreign-based and/or directed by countries or groups outside the United States or whose activities transcend national boundaries.

National Frequency

From the years 1983 through 1990, the Federal Bureau of Investigation (FBI) identified a total of 105 terrorist incidents that occurred in the United States (See *Figure 30).*

Regions at Risk

Nationwide. In recent years, the largest number of terrorist strikes occurred in the Western States and Puerto Rico. Attacks in Puerto Rico accounted for about 60 percent of all terrorist incidents between 1983 and 1990 that occurred on US territory.

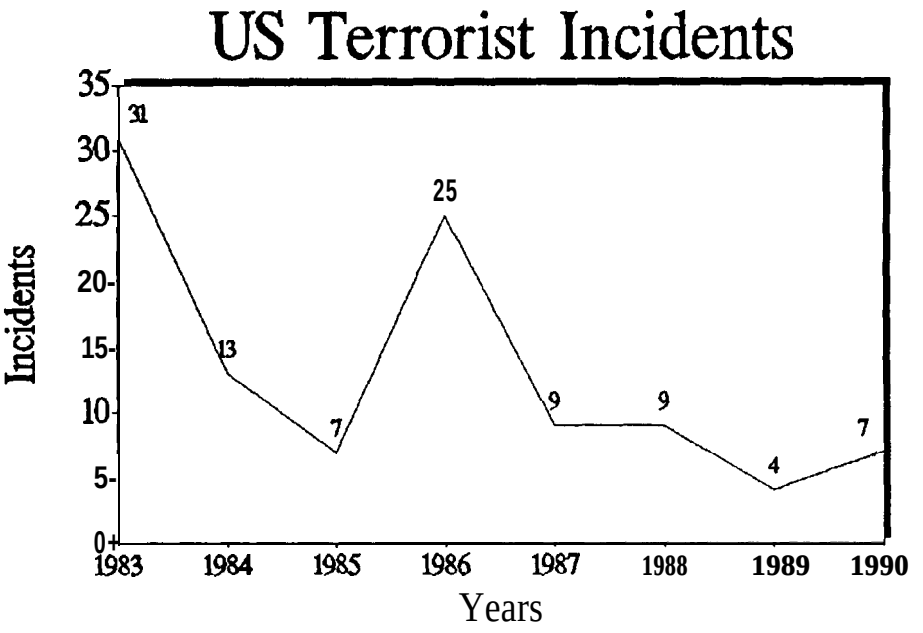
Season(s)

A terrorist incident can occur at any time of the year.

Effects

A terrorist attack can take a number of forms, depending on the technological means available to the terrorist, the nature of the political issue motivating the attack, and the points of weakness of the terrorist's target. Among the possibilities are:

- **Bombing.** Most terrorist incidents in the US have involved bombing attacks, including detonated and undetonated explosive devices, tear gas, pipe and fire bombs and a rocket attack
- **Airline Attack.** Despite efforts to improve airline security in the United States, some note that US airport security still falls short of necessary standards. Common practices such as curbside check-in of airline baggage and free access of non-passengers to airports create a considerable potential for airline related terrorist incidents to occur.



Source: Department of Justice, ***Terrorism in the United States***

Figure 30

- **Chemical/Biological Attack.** Terrorists can use chemical or biological weapons to either extort or deliberately try to kill in order to further political goals. Toxins or even some radiological materials, like the water-soluble plutonium chloride, could become a credible threat to municipal water supplies.
- **Infrastructure Attack.** A group of terrorists could coordinate an attack against utilities and other public services. Modem society's dependence on automation allows the terrorist to target computers as a means of causing chaos. The recent revelation that Dutch computer hackers were able to successfully gain access to Defense Department computers at 34 different sites is an illustration of the immediacy of the danger.

The effects of the threats posed by terrorism can vary significantly in relationship to the size and scale of the event and its associated severity. At **a** minimum, disruptions can include property damage, disruptions in services such as electricity, water supply, public transportation, communications, etc., and loss of life.

Worst Event

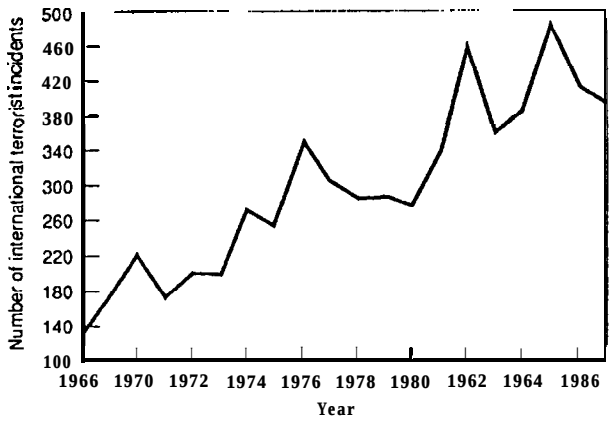
One death and 19 injuries were attributed to domestic terrorism in 1986. No deaths or injuries have been recorded since then.

Discussion

Compared to other countries, there has been only a limited number of terrorist incidents that have occurred within the borders of the United States. Still, as the RAND Corporation's chronology of international terrorism notes, while North America has one of the lowest number of terrorist incidents, the United States stands as the number one target of international terrorist actions. And, as *Figure* 31 illustrates, the past two decades have witnessed a general increase in recorded terrorist incidents in the world. Terrorists overseas, like Yu Kikumura of the Japanese Red Army, have already started to look for opportunities to make their point on American territory. Inevitably, increasing numbers of America's local emergency managers will have to face the task of dealing with the consequences of terrorist actions.

Besides a possible increase in the frequency of terroris, ·idents, each incident is likely to become more difficult to manage. ·rorists have started to become more technically accomplished in recent years. Among the terrorists participating in the 1988 hijacking of a Kuwait Airlines jet was a trained pilot. The Chukakuha of Japan provided an example of high-tech terrorism in November 1985 by simultaneously cutting the communications and control cables of the Japanese National Railroad at 30 different locations. Thirteen million rail passengers and 30,000 tons of freight were stranded at an estimated cost of 2 billion yen. In the future, such attempts to attack the nation's infrastructure are expected to become more common.

International Terrorist Incidents



Trends in international terrorism: 1968–1987

Source: *The RAND Chronology of International Terrorism for* 1987

Figure 31

RANKING OF THE THREATS

In its direction to FEMA, the Committee stated that it *"...understands that certain natural and manmade disasters fhreaten communities with a varying degree of severify and frequency..."* and specifically requested that the study, *"...rank the principal threats to the population according to region and any other factors deemed appropriate."* However, it is important to note that any ranking of the threats to communities and emergency management coordinators is potentially misleading because of: (1) the wide variations that can occur with the application of different criteria to the same threat, (2) the significant differences that can occur from the impact of a particular threat on a region and the individual States within that region, (3) the fact that threats in one region are not necessarily applicable to another region, (4) variances in the types of data collected on each threat and (5) the lack of available data in some cases with which to develop a reasoned ranking.

This is perhaps best typified in the application of criteria which must be used in order to develop the rankings. A ranking of threats can be based on:

- The reports of local jurisdictions on the threats they face.
- The average annual loss of life caused by each type of hazard,
- The severity of the death toll caused by the worst instance of each type of disaster.
- The number and types of disasters requiring a Presidential declaration to provide Federal recovery assistance.
- The average annual economic loss caused by each hazard.

Figure 32 illustrates the results of using these different methods of ranking hazards. The lack of a consistent pattern of results between the various methods of ranking shows the difficulties in arriving at a single definition of what are actually the most dangerous hazards facing the communities across the nation.

Local Hazard identification

In a survey periodically conducted by FEMA, local emergency managers themselves identify the hazards that threaten their communities. They report on the hazards that: (1) have actually, or have a high possibility of affecting their jurisdiction, considered a "significant" hazard, and (2) the hazards that could potentially strike their community, a "possible" hazard. *Figure 33* ranks the 26 hazards listed in the

THREAT RANKINGS BY VARIOUS CRITERIA

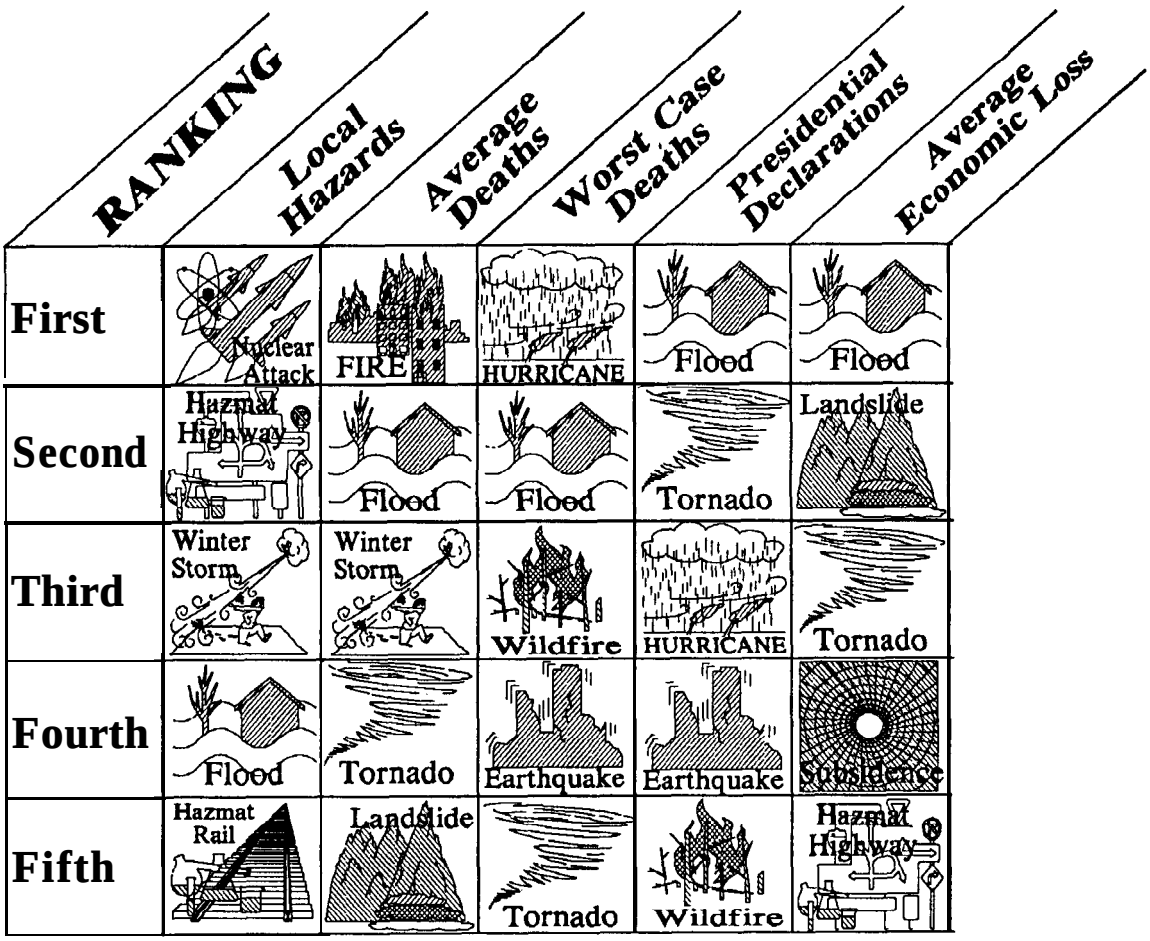


Figure 32

FEMA 1988 survey by the number of communities that cited them as threats. *Nuclear attack* was mentioned the most as both a significant and a possible threat. Second most mentioned was *Hazardous Materials Incident — Highway*, again both as a significant and a possible threat. The next most significant threats were Winter *Storm, Flood, and Hazardous Materials Incident — Rail.* In terms of possible threats, the next most mentioned hazards were *Power* Failure, *Flood,* and Winter *Storm. The* information presented here is from the Fiscal Year 1988 survey of local emergency managers. FEMA is currently conducting a new study of national civil defense requirements. The study, which goes through Fiscal Year 1993, will survey State and local emergency coordinators on their perception of the principal threats they face. Future editions of this report will include updated information on changes in perceived threats among State and local emergency managers as a result of recent world events.

Hazards Identified by Local Emergency Managers

(Ranked by Number of Responses)

"Significant" Hazard Rankings

1. Nuclear Attack
2. Hazardous Materials Incident — Highway
3. Winter Storm
4. Flood
5. Hazardous Materials Incident — Rail
6. Power Failure
7. Tornado
8. Hazardous Materials Incident — Fixed Facility
9. Urban Fire
10. Radiological Incident — Transportation
11. Drought
12. Hazardous Materials Incident — Pipeline
13. Wildfire
14. Air Transport Incident
15. Dam Failure
16. Earthquake
17. Rail Transportation Incident
18. Hurricane/Tropical Storm
19. Civil Disorder
20. Hazardous Materials Incident — River
21. Radiological Incident — Fixed Facility
22. Subsidence
23. Landslide
24. Volcano
25. Tsunami
26. Avalanche

"Possible" Hazard Rankings

1. Nuclear Attack
2. Hazardous Materials Incident — Highway
3. Power Failure
4. Fbod
5. Winter stornl
6. Radiological Incident — Transportation
7. Tornado
8. Drought
9. Hazardous Materials Incident — Fixed Facility
10. Urban Fire
11. Hazardous Materials Incident — Rail
12. Wildfire
13. Hazardous Materials Incident — Pipeline
14. Earthquake
15. Civil Disorder
16. 'Air Transport Incident
17. Dam Failure
18. Rail Transportation hcident
19. Hurricane/Tropical Storm
20. Hazardous Materials hcident — River
21. Radiological Incident — Fixed Facility
22. Subsidence
23. Landslide
24. Avalanche
25. Volcano
26. Tsunami

Source: FEMA, CPG 1-35, Hazard Identification, Capability Assessment and Multi-Year Development Plan for Local Governments

Figure 33

Annual Deaths

If the ranking was to be based on the average annual number of deaths alone, the rankings would change dramatically. Even though the data on deaths are relatively incomplete (data are only available on one-third of the hazards on an annual basis and one-half on a worst case basis), the top five threats based on the average annual number of deaths would be: *(1) urban fires-5900 deaths, (2) floods-146 deafhs, (3) winter storms-93 deaths, (4) tornadoes-74 deaths, (5) landslides-2550 deaths.*

Worst Case Deaths

The difference is even more dramatic when compared to a ranking based on **the worst-case deaths.** Based on this data, the rankings would be as follows: *(1) hurricanes-6,000 deaths from the Galveston, Texas hurricane in 1900, (2) floods-2,209 deaths from the Johnstown, Pennsylvania flood in 1889, (3) wildfires-l,182 deaths from a wildfire in Wisconsin in 1871, (4) earthquakes-700 deaths from the San Francisco, California earthquake in 1906, (5) tornadoes-wifh 689 deaths in 1925.*

Presidential Declarations

An examination of Presidential disaster declarations, as a measure of the most severe disasters over a ten year period (Fiscal Year 1982 through Fiscal Year 1991) gives the following ranking of hazards. Se*vere storms and flooding (144 declarations)* would rank first in terms of hazards to the nation's communities. Tornadoes and their associated effects would rank second, with a total of 57 *declarations* over the period. Hurricanes *and typhoons* (a combined total of 43 *declarations)* ranks third. *Severe winter weather (15 declarations)* and *fires (7 declarations)* rank fourth and fifth respectively. (See *Figure 34).*

PRESIDENTIAL DISASTER DECLARATIONS

October 1, 1981 to September 30, 1991

Hazard	No. of Declarations
Severe Storms & Flooding	144
Tornadoes & Flooding	30
Tornadoes	27
Hurricanes	27
Typhoons	16
Severe Winter Weather	15
Fires	7
Earthquakes	4
Volcanic Eruptions	1
Total	271

Figure 34

Economic Loss

And finally, if rankings are prepared on the basis of economic loss alone, the list changes yet again. Based on available figures on the average annual losses from various incidents, the rankings are as follows: *(1) floods-$2.2 billion, (2) landslide—$1-2 billion, (3) tornadoes—$590 million, (4) subsidence-in excess of $125 million, (5) highway hazardous materials incidents-$19 million.*

Summary

This review of the greatest dangers facing the nation shows that it is difficult to develop a single list enumerating the relative threat posed by each hazard compared to all others. Still, a sense of priorities does emerge. Natural hazards, particularly the meteorological ones, dominate in the review. Fire and hazardous material incidents also consistently show up in the rankings as a major threat.

Floods represent an ever-present threat to people and property in every State of the nation. The average annual figure for economic damage from floods, derived from losses during the years 1981-1990, is 2.2 *billion.* Perhaps the most pervasive of the natural hazards, floods affect all regions of the country to varying degrees. The Upper Northwest, including Washington, Oregon, Alaska, Idaho, Montana and Wyoming, has the lowest percentage of flood-prone areas, totaling O-5 percent of the total land area of these States. The midwestern region, comprised of the States of North Dakota, South Dakota, Nebraska, Iowa, Missouri, Kansas, Illinois, Indiana, Wisconsin, Minnesota, Michigan, Ohio and Kentucky, has O-20 percent of its total land area prone to flooding. The same ratio, O-20 percent, applies to the western region, which includes the States of California, Nevada, Arizona, Utah, Colorado, New Mexico and Hawaii. The States in the southern region (North Carolina, South Carolina, Georgia, Alabama, Florida, Tennessee, Arkansas, Louisiana, Mississippi, Oklahoma and Texas) have the highest percentage of flood-prone land areas, a total of O-30 percent.

Hurricanes and tropical *storms* are also of particular concern to all southern and eastern coastal States from Texas to Maine. During the period 1871-1989, *185* hurricanes and tropical storms hit the coastal areas from North Carolina to Texas; 33 hurricanes and tropical storms affected the coastal region stretching from Virginia to Maine. More than 13,000 people have lost their lives in hurricanes from Texas to the northeast in the years of 1900-1989. Property losses from major hurricanes during that time exceeded $43 *billion.*

The long-term effects of major hurricanes are particularly serious. The high winds that hurricanes trigger can cause enormous timber losses. Massive storm surges that result from the forces of cyclonic winds on the ocean below can substantially change the geography of a severely hit coastal area. In addition, hurricanes are classic examples of the types of disasters that can trigger "secondary effects" such as tornadoes and flooding which, together with storm surges, can cause extensive damage. Because of the frequently erratic paths of hurricanes, inland States from Oklahoma on a northeastward path to Ohio, Pennsylvania, New York and the New England States can sustain significant damage from the downgraded remnants of hurricanes.

Tornadoes present a threat to all regions of the country, but the southem and midwestem States are particularly susceptible to them. During the period 1959-1988, a staggering 21,343 tornadoes struck the southem region, including the States of North Carolina, South Carolina, Georgia, Alabama, Florida, Tennessee, Arkansas, Louisiana, Mississippi, Oklahoma and Texas. During the same period, 9,234 tornadoes

struck the Midwestern region, comprised of the States of North Dakota, South Dakota, Nebraska, Iowa, Missouri, Kansas, Illinois, Indiana, Wisconsin, Minnesota, Michigan, Ohio and Kentucky. In the remaining areas of the country, 513 tornadoes struck the southwestern States, including California; 1,091 affected the northeastern and mid-Atlantic States and 583 occurred in the upper northwestern States. Although many tornadoes hit sparsely populated, rural areas, they are a serious threat to many States and cause scores of deaths and millions of dollars in property damage on an annual basis.

Winter stows are a common occurrence every year in various areas of the country. Still, they result in deaths and injuries in the hundreds, along with economic losses of hundreds of millions of dollars. The ice storm that struck western and northern New York in March 1991, creating losses at well over $100 million, is perhaps the most costly natural disaster in the history of New York State.

Earthquakes are a particularly serious threat. While mitigation measures such as building codes can be implemented to reduce the potential damage from an earthquake, some preparedness general are particularly difficult because of the lack of warning prior to an occurrence. In terms of the potential for significant loss of life and damages totaling in the billions of dollars (particularly in urbanized areas), major earthquakes pose a serious threat to the population in risk areas-especially to those populations in the high-risk areas of California and associated risk areas in the western United States.

Landslides, one of the less dramatic hazards, still represent a major threat. Regions at risk from landslides stretch across the country. Landslides take tens of lives every year, with estimated property losses reaching billions of dollars annually.

Fire, based on its frequency of occurrence, areas affected, and the toll it takes in lives and property every year, could be the number one threat facing the American population today. As noted earlier, the annual average of reported fires in the United States during the years 1983-1987 were *2,300,000,* which resulted in an average of 5,900 *civilian fire deaths, 29,000 civilian injuries and $7.8 billion in losses from fire* ***each*** *year.*

Hazardous materials transportation incidents are a newer threat that is becoming a major challenge to the nation's emergency managers. The country's roads and railways see thousands of hazardous material incidents every year, occasionally resulting in some deaths. The direct costs of such incidents, along with the indirect costs that arise from

transportation disruption and the need for people to evacuate from a hazardous materials scene, make this one of the most significant hazards the nation now faces.

Floods, hurricanes, tornadoes, winter storms, earthquakes, landslides, fires and hazardous material incidents represent the primary threats facing communities and emergency management coordinators. This by no means diminishes the magnitude of the many other threats discussed in this report. The national security threat, for one, is recognized as a key responsibility of the nation's emergency managers. All hazards must be addressed in the effort to adequately protect the nation's people and property from the threats they face.