

IF TERROR REIGNS, WILL TORTS FOLLOW?

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INTRODUCTION

The tragedy of September 11 has changed the way that Americans live. We are subject to greater scrutiny in airports, buildings, hotels, concerts, sports events—wherever we gather in large numbers. Industry has dramatically increased its security standards. Disaster plans, contingency plans, evacuation plans, and emergency response plans—whatever name one wishes to give to the steps that will be taken by a person or entity to protect human health and life, and to maintain business continuity in response to a variety of hypothetical terrorist attacks—have multiplied.

We pray that 9/11 is an event in American history that will never repeat itself. Vigilance remains the challenge; complacency is the fear. If terror reigns, however, will torts follow? This paper aims to make a contribution to the issues facing potential tort plaintiffs and defendants in the context of a post-9/11 world. **Will 9/11 affect the “duty of care” that is the *sine qua non* of a tort action? And in the post-9/11 efforts to develop emergency plans trying to anticipate different forms of terrorist attacks, who may be at risk from the attacks, and how to respond to the attacks, will courts permit the recovery of economic losses? And if so, will a jury’s finding on “foreseeability” be predetermined?**

Using the 1928 decision in *Palsgraf v. The Long Island Railroad Company*¹ and the 1985 decision in *People Express Airlines, Inc. v. Consolidated Rail Corporation et al.*,² as a backdrop, the importance of “context”—the historical framework within which a duty/foreseeability determination is made—is first emphasized. Next, this article identifies talked-about biological, chemical, radioactive, and conventional terrorist threats in an attempt to describe the duty/foreseeability context of future torts arising out of terrorist attacks. Finally, this article examines legislative actions designed to limit liability for claims arising out of terrorism-related acts, the impact of terrorism-excluded insurance coverage, and pending legislation which attempts to address insurance risks posed by terrorism.

DUTY OF CARE UNDER PALSGRAF

Although decided nearly 75 years ago, the *Palsgraf* decision has had a continuing impact on tort law. The facts are straightforward. Mrs. Palsgraf had the misfortune of being injured by falling scales when she was standing on a rail passenger platform awaiting her train to Rockaway Beach.³ The injury followed this sequence of events. “A train stopped at the station, bound for another

1. 162 N.E. 99 (N.Y. 1928).

2. 495 A.2d 107 (N.J. 1985).

3. *Palsgraf*, 162 N.E. at 99.

place.”⁴ A man carrying a package under his arm ran to catch a train.⁵ The package was wrapped in a newspaper.⁶ The man jumped aboard the car.⁷ He appeared unsteady so a guard, who had held a door on the train open for the man, reached forward to help the man.⁸ Another guard on the platform pushed the man from behind.⁹ The package carried by the man fell upon the rail tracks.¹⁰ The package “contained fireworks, but there was nothing in its appearance to give notice of its contents.”¹¹ The fireworks exploded.¹² “The shock of the explosion threw down some scales at the other end of the platform many feet away.”¹³ Mrs. Palsgraf was struck by the scales, was injured, and sued.¹⁴ A jury found the defendant liable for Mrs. Palsgraf’s damages.¹⁵ The defendant appealed.¹⁶

A majority of the New York Court of Appeals reversed.¹⁷ Writing for the Court of Appeals, Judge Cardozo determined that the conduct of the guard “was not a wrong in its relation to the plaintiff, standing far away.”¹⁸ Because there was nothing about the package that gave notice of its potentially perilous contents, the railroad was found to have owed no duty to Mrs. Palsgraf:

If no hazard was apparent to the eye of ordinary vigilance, an act innocent and harmless, at least to outward seeming, with reference to her, did not take to itself the quality of a tort because it happened to be a wrong, though apparently not one involving the risk of bodily insecurity, with reference to some one else.¹⁹

The Court of Appeals explained that any other result would be untenable, giving these pre-9/11 examples:

A guard stumbles over a package which has been left upon a platform. It seems to be a bundle of newspapers. It turns out to be a can of dynamite. To the eye of ordinary vigilance, the bundle is abandoned waste, which may be kicked or trod on

4. 162 N.E. at 99.

5. *Id.*

6. *Id.*

7. *Id.*

8. *Id.*

9. 162 N.E. at 99.

10. *Id.*

11. *Id.*

12. *Id.*

13. *Id.*

14. 162 N.E. at 99.

15. *Id.*

16. *Id.*

17. *Id.*

18. *Id.*

19. 162 N.E. at 99.

with impunity. Is a passenger at the other end of the platform protected by the law against the unsuspected hazard concealed beneath the waste?²⁰

One who jostles one's neighbor in a crowd does not invade the rights of others standing at the outer fringe when the unintended contact casts a bomb upon the ground. The wrongdoer as to them is the man who carries the bomb, not the one who explodes it without suspicion of the danger. Life will have to be made over, and human nature transformed, before prevision so extravagant can be accepted as the norm of conduct, the customary standard to which behavior must conform.²¹

There was a lone dissent.²² Judge Andrews argued that the act of knocking the package from the passenger's arm was negligence.²³ The only issue thereafter was what damage proximately flowed from the negligence.²⁴ Saying that injury in some form was probable based on the explosion that followed, Judge Andrews felt that, as a matter of law, he could not say that Mrs. Palsgraf's "injuries were not the proximate result of the negligence."²⁵ Judge Andrews borrowed this example from an "unpublished manuscript" on the law of torts:

A chauffeur negligently collides with another car which is filled with dynamite, although he could not know it. An explosion follows. A, walking on the sidewalk nearby, is killed. B, sitting in a window of a building opposite, is cut by flying glass. C, likewise sitting in a window a block away, is similarly injured. And a further illustration: A nursemaid, ten blocks away, startled by the noise, involuntarily drops a baby from her arms to the walk. We are told that C may not recover while A may. As to B it is a question for the court or jury. We all agree that the baby might not. Because, we are again told, the chauffeur had no reason to believe his conduct involved any risk of injuring either C or the baby. As to them he was not negligent.²⁶

Judge Andrews argued, however, that the chauffeur's "belief that the scope of the harm he might [inflict] would be limited is immaterial" because "[h]is act unreasonably jeopardized the safety of any one who might be affected by it."²⁷ In other words, the duty existed. If recovery is to be denied to C and to the baby, it is because of the absence of proximate cause, Judge Andrews argued, adding: "And here not what the chauffeur had reason to believe would be the result of his conduct, but what the prudent would foresee, may have a bearing. . . ."²⁸

20. 162 N.E. at 100.

21. *Id.*

22. *Id.* at 101 (Andrews, J., dissenting).

23. *Id.* at 105.

24. *Id.*

25. 162 N.E. at 104-05.

26. *Id.* at 104.

27. *Id.*

28. *Id.*

And in comments that have been quoted often to explain decisions finding no duty of care, Judge Andrews declared: "It is all a question of expediency. There are no fixed rules to govern our judgment. There are simply matters of which we may take account. . . . There is in truth little to guide us other than common sense."²⁹

FORESEEABILITY UNDER *PEOPLE EXPRESS*

Fast forward nearly 60 years. *Palsgraf* happens to be the first decision (among many) cited by the New Jersey Supreme Court in *People Express Airlines* where the discussion of legal duty and foreseeability of harm produced the opposite outcome.³⁰

The facts were again uncomplicated. "On July 22, 1981, a fire began in the Port Newark freight yard of defendant Consolidated Rail Corporation (Conrail) when ethylene oxide . . . escaped from a tank car, punctured during a 'coupling' operation with another rail car, and ignited."³¹ The plaintiff was an airline that was housed in the North Terminal building of the adjacent Newark Airport.³² Fearing the risk of an explosion from the burning tank car, the airline's employees were evacuated and not permitted to return for 12 hours.³³ *People Express* sought damages for the economic losses it alleged were sustained by its inability to conduct business for this length of time.³⁴ The trial court granted summary judgment to the railroad.³⁵ The Appellate Division reversed,³⁶ and the New Jersey Supreme Court affirmed the Appellate Division's decision.³⁷

At oral argument before the New Jersey Supreme Court, *People Express* argued that "some of the defendants were aware from prior experiences that ethylene oxide is a highly volatile substance. . . ."³⁸ Wisely, in hindsight, it also argued that "emergency response plans in case of an accident had been prepared."³⁹ And, in fact, after the fire occurred, "some of the defendants' consultants helped determine how much of the surrounding area to evacuate. The municipal authorities then evacuated the area within a one-mile radius

29. 162 N.E. at 104.

30. *People Express Airlines*, 495 A.2d at 107.

31. *Id.* at 108.

32. *Id.*

33. *Id.*

34. *Id.*

35. 495 A.2d at 109.

36. 476 A.2d 1256 (N.J. App. Div. 1984).

37. *People Express Airlines*, 495 A.2d at 107.

38. *Id.* at 108.

39. *Id.*

surrounding the fire to lessen the risk to persons within the areas should the burning tank car explode.”⁴⁰

People Express did not claim physical harm to person or property.⁴¹ Its alleged losses were purely economic.⁴² By seeking a recovery, it was challenging a “virtually *per se* rule barring recovery for economic loss unless the negligent conduct also caused physical harm,”⁴³ a doctrine that continues to be the subject of considerable analysis and debate.⁴⁴

The court surveyed the case law and concluded that the rationales supporting the prohibition on recovery of economic loss, while understandable, were so riddled with exceptions that meritorious claims were being unfairly denied: “The asserted inability to fix chrySTALLINE formulae for recovery on the differing facts of future cases simply does not justify the wholesale rejection of recovery in all cases.”⁴⁵

The New Jersey Supreme Court reviewed those exceptions, focusing its analysis on (1) the foreseeability of events and (2) what the defendant knew or should have known about the consequences of the defendant’s acts.⁴⁶ One group of exceptions, the New Jersey Supreme Court explained, involved the “special relationship” between an alleged tortfeasor and a plaintiff deprived of economic expectations even though it did not have a direct relationship with the defendant:

Courts have justified their finding of liability in these negligence cases based on notions of a special relationship between the negligent tortfeasors and the foreseeable plaintiffs who relied on the quality of defendants’ work or services, to their detriment. The special relationship, in reality, is an expression of the courts’ satisfaction that a duty of care existed because the plaintiffs were particularly foreseeable and the injury was proximately caused by the defendant’s negligence.⁴⁷

The New Jersey Supreme Court cataloged the “special relationship” cases in the category of “negligent misrepresentation” and cited numerous examples, involving auditors, surveyors, termite inspectors, engineers, attorneys, notaries, architects, and weighers who were found to have had a duty to plaintiffs making claims against them.⁴⁸

40. 495 A.2d at 108.

41. *Id.* at 109.

42. *Id.*

43. *Id.* at 109. The most oft-cited case is *Robins Dry Dock & Repair Co. v. Flint*, 275 U.S. 303 (1927) (prohibiting recovery against an entity that negligently damaged a vessel in port in an action by a time charterer for the inability to use a vessel while it was being repaired).

44. See generally Herbert Bernstein, *Civil Liability for Pure Economic Loss Under American Tort Law*, 46 AM. J. COMP. L. 111 (1998). Kenneth S. Abraham, *The Trouble with Negligence*, 54 VAN. L. REV. 1187 (2001).

45. *People Express Airlines*, 495 A.2d at 111.

46. *Id.* at 112.

47. *Id.*

48. *Id.* at 112-13.

A second category of exceptions, the New Jersey Supreme Court explained, involves recovery to persons in a "particularly foreseeable group, such as sailors and seamen, for whom the law has traditionally shown great solicitude."⁴⁹ In both sets of cases:

courts "have found it fair and just,"

...
to impose liability on defendants who, by virtue of their special activities, professional training or other unique preparation for their work, had particular knowledge or reason to know that others ... would be economically harmed by negligent conduct. In this group of cases, even though the particular plaintiff was not always foreseeable, the particular class of plaintiffs was foreseeable as was the particular type of injury.⁵⁰

The New Jersey Supreme Court described another category of cases where recovery of economic loss without physical harm was permitted as "cases akin to private actions for public nuisance."⁵¹ Cases such as *Guste v. M/V Testbank*⁵²

49. 495 A.2d at 113.

50. *Id.*

51. *Id.*

52. 752 F.2d 1019 (5th Cir. 1985) (*en banc*). The Fifth Circuit decision involved the collision of a bulk carrier and a container ship in the Mississippi River Gulf outlet. *Id.* at 1020. The collision caused the release of hydrobromic acid to the air and the loss of 12 tons of pentachlorophenol into the river. *Id.* The outlet was closed for 19 days and all fishing, shrimping, and related activity was temporarily suspended in the outlet and four-hundred square miles of surrounding marsh and waterways. *Id.* A majority of the *en banc* court rejected claims for economic losses "by shipping interests suffering losses from delays or rerouting, marina and boat operators, wholesale and retail seafood enterprises not actually engaged in fishing, shrimping, crabbing or oystering in the area, seafood restaurants, tackle and bait shops, and recreational fishermen, oystermen, shrimpers, and crabbers." *Id.* at 1021, n.2. The Court of Appeals' majority determined that there must be physical damage or injury to a proprietary interest before a recovery for economic losses can be permitted. *Id.* at 1021. In the same breath, the Court of Appeals noted that the rights of commercial fishermen were not before the court and that "[a] substantial argument can be made that commercial fishermen possess a proprietary interest in fish in waters they normally harvest sufficient to allow recovery for their loss. Whether the claims of commercial fishermen ought to be analyzed in this manner or simply carved from the rule today announced, in the fashion of *Union Oil*, or allowed at all, we leave for later." *Id.* at 1027, n.10. Judge Wisdom wrote a vigorous dissent that rejected the policy arguments articulated by the majority, and suggested that the fear of unlimited liability was overdone: "The limitation imposed by 'particular' damages, together with refined notions of proximate cause and foreseeability, provides a workable scheme of liability that is in step with the rest of tort law, compensates innocent plaintiffs, and imposes the costs of harm on those who caused it." *Id.* at 1046 (Wisdom, Rubin, Politz, Tate, and Johnson, JJ., dissenting). Judge Wisdom's test focused not on the absence of a duty of care but instead on proximate cause, foreseeability, and "particular" damage: (1) "the damage must be proximately caused by the accident"; (2) allowable claims, under foreseeability rules, are only those "arising from activities in process at the time of the accident or [those] that can be proven with certainty"; and (3) damages must be "particular" and distinguishable from those suffered by the general public. *Id.* at 1049.

and *Union Oil Co. v. Oppen*⁵³ were cited to illustrate the New Jersey Supreme Court's characterization of permitted recoveries "[w]here a plaintiff's business is based in part upon the exercise of a public right":⁵⁴

The theory running throughout these cases, in which the plaintiffs depend on the exercise of the public or riparian right to clean water as a natural resource, is that the pecuniary losses suffered by those who make direct use of the resource are particularly foreseeable because they are so closely linked, through the resource, to the defendants' behavior.⁵⁵

As if to emphasize its point that the "no recovery for economic loss" rule had significantly eroded, the New Jersey Supreme Court then cited *Clay v. Jersey City*⁵⁶ where a lessee-manufacturer had to vacate its tenancy because Jersey City negligently failed to maintain the plaintiff's sewer line while repairs were being undertaken.⁵⁷ Damage to the physical premises was regarded as the claim of the owner.⁵⁸ The tenant's damages related solely to loss of use of the premises—"purely" economic loss.⁵⁹ Both were permitted, the court noted, adding that Jersey City "had had notice of the leak [for several years] and should have known about it even earlier."⁶⁰

The New Jersey Supreme Court extracted two themes from its discussion of the exceptions to the rule that economic losses were not recoverable in a negligence action:

1. "[K]nowledge or special reason to know of the consequences of the tortious conduct in terms of the persons likely to be victimized and the nature of the damages likely to be suffered will suffice to impose a duty upon the tortfeasor not to interfere with economic well-being of third parties."⁶¹

53. *Oppen*, 501 F.2d 558 (9th Cir. 1974). *Oppen* involved claims of commercial fishermen for economic losses resulting from an oil spill from Union Oil's Platform A in the Santa Barbara Channel in 1969. *Id.* at 559. The Court of Appeals determined that the claims were foreseeable and, therefore, the commercial fishermen's claims were compensable under California negligence law despite the economic loss rule: "To assert that the defendants were unable to foresee that negligent conduct resulting in a substantial oil spill could diminish aquatic life and thus injure the plaintiffs is to suppose a degree of general ignorance of the effects of oil pollution not in accord with good sense." *Id.* at 569. The Court of Appeals explained that its holding was limited to commercial fishermen, and did "not open the door to claims that may be asserted by those . . . whose economic or personal affairs were discommoded by the oil spill of January 28, 1969." *Id.* at 570.

54. *People Express Airlines*, 495 A.2d at 113.

55. *Id.* at 114.

56. *Id.* (citing 181 A.2d 545 (N.J. Ch. 1962)), *aff'd*, 84 N.J. Super. 9 (App. Div. 1964).

57. *Id.* at 114.

58. *Id.*

59. *People Express Airlines*, 495 A.2d at 114.

60. *Id.*

61. *Id.* at 115.

2. "The foreseeability standard that may be synthesized from these cases is one that posits liability in terms of where, along a spectrum ranging from the general to the particular, foreseeability is ultimately found."⁶²

The court imagined a fairness scale: "[t]he more particular is the foreseeability that economic loss will be suffered by the plaintiff as a result of defendant's negligence, the more just is it that liability be imposed and recovery allowed."⁶³

The New Jersey Supreme Court then stated its holding:

We hold therefore that a defendant owes a duty of care to take reasonable measures to avoid the risk of causing economic damages, aside from physical injury, to particular plaintiffs or plaintiffs comprising an identifiable class with respect to whom defendant knows or has reason to know are likely to suffer such damages from its conduct. A defendant failing to adhere to this duty of care may be found liable for such economic damages proximately caused by its breach of duty.⁶⁴

The New Jersey Supreme Court "stress[ed]" that "an identifiable class of plaintiffs is not simply a foreseeable class of plaintiffs."⁶⁵ It explained, for example, that a sales person delayed in the conduct of business because a highway is closed due to a negligently caused accident may be a foreseeable plaintiff, but the presence of such a person in the area "would be fortuitous, and the particular type of economic injury that could be suffered by such persons would be hopelessly unpredictable and not realistically foreseeable."⁶⁶ Rather:

An identifiable class of plaintiffs must be particularly foreseeable in terms of the type of persons or entities comprising the class, the certainty or predictability of their presence, the approximate numbers of those in the class, as well as the type of economic expectations disrupted.⁶⁷

62. 495 A.2d at 115.

63. *Id.* at 116.

64. *Id.* The New Jersey Supreme Court later explained:

We do not mean to suggest by our recitation of these facts that actual knowledge of the eventual economic losses is necessary to the cause of action; rather, particular foreseeability will suffice. The plaintiff still faces a difficult task in proving damages, particularly lost profits, to the degree of certainty required in other negligence cases. The trial court's examination of these proofs must be exacting to ensure that damages recovered are those reasonably to have been anticipated in view of the defendants' capacity to have foreseen that this particular plaintiff was within the risk created by their negligence.

Id. at 118.

65. *Id.* at 116.

66. *Id.*

67. 495 A.2d at 116.

The court recognized:

that some cases will present circumstances that defy the categorization here devised to circumscribe a defendant's orbit of duty, limit otherwise boundless liability and define an identifiable class of plaintiffs that may recover. In these cases, the courts will be required to draw upon notions of fairness, common sense and morality to fix the line limiting liability as a matter of public policy, rather than an uncritical application of the principle of particular foreseeability.⁶⁸

If a duty is found to exist, that does not end the inquiry. *People Express* teaches further that "particular foreseeability" may also be employed to determine if the economic injury was proximately caused.⁶⁹ The kinds of considerations that were to be taken into account to determine whether economic losses were "particularly foreseeable and proximate" were listed by the court: "The economic injury was close in time and space; the defendant had ample opportunity to ascertain the identity and nature of the plaintiff's interests. Further, the amount of litigation and extent of liability was finite, rather than expansive."⁷⁰

The New Jersey Supreme Court concluded its proximate cause analysis by holding that "a defendant who has breached his duty of care" to "particularly foreseeable plaintiffs may be held liable" for those economic losses that "are the natural and probable consequence of a defendant's negligence in the sense that they are reasonably to be anticipated in view of defendant's capacity to have foreseen that the particular plaintiff or identifiable class of plaintiffs . . . is demonstrably within the risk created by defendant's negligence."⁷¹

In applying this holding to the facts, the New Jersey Supreme Court determined that *People Express* was entitled to a trial on the merits.⁷² What persuaded the court were, at least, the following facts:

- (1) "the close proximity of the North Terminal and People Express Airlines to the Conrail freight yard";
- (2) "the obvious nature of the plaintiff's operations and particular foreseeability of economic losses resulting from an accident and evacuation";
- (3) "the defendants' actual or constructive knowledge of the volatile properties of ethylene oxide; and"
- (4) "*the existence of an emergency response plan prepared by some of the defendants . . . which apparently called for the nearby area to be evacuated to avoid the risk of harm in case of an explosion.*"⁷³

68. 495 A.2d at 116.

69. *Id.*

70. *Id.* at 117

71. *Id.* at 118.

72. *Id.*

73. 495 A.2d at 118 (emphasis added). As a reminder, the emergency response plan was described in oral argument, and, by inference, was not a subject of briefing. *Id.* at 108. One might argue that this fact was essential to support the New Jersey Supreme Court's analysis.

It is this last foreseeability fact that takes on added future tort significance in the post-9/11 world of vulnerability assessments, risk assessments, and emergency response plans, as will be discussed below.

THE DUTY AND FORESEEABILITY LANDSCAPE AFTER 9/11

Palsgraf's determination that foreseeability is part of the calculus to determine the existence of a duty of care remains a subject of legal debate. Whatever one's view, a railroad employee who kicks what appears to be a stack of newspapers or improperly handles an innocent looking piece of abandoned luggage, but which actually contains an explosive that is thereby detonated, will after 9/11, generate a different analysis from the one that Judge Cardozo used in *Palsgraf*. Similarly, an individual carrying a seemingly mundane package which contains an explosive, who tosses it on a rail track below a platform on which there are standing dozens of people would prompt a different look by Judge Cardozo after 9/11 if there was no screening of packages under circumstances that warranted screening. Threats that were imagined—or more fairly, not imagined—months ago, now are the subject of daily newspaper stories.

Foreseeability is not a static concept, as *People Express* explained. It must have a context and that context will vary over time. Economic losses are grave matters. Even with the heightened burden of proof placed on *People Express* to prove proximately caused damages,⁷⁴ the erosion of the economic loss rule in the arena of the future terrorist tort could have debilitating consequences for defendants. Yet emergency plans to save lives and minimize the risk of harm may actually demonstrate the existence of “particular foreseeability” that could affect both the outcome of the “duty” inquiry and the presence or not of proximate cause for damages, especially if the response is not consistent with the plan.

What are the terrorist contexts against which planning is ongoing and within which future tort actions might be brought? September 11 has prompted unprecedented discussion of biological, chemical, radioactive, and conventional terrorist threats to human health and life and business continuity. These threats are described generally below.⁷⁵ These questions should be asked in considering each threat:

- Who is potentially at risk from the threat?
- What duty of care, if any, might be said to exist to those potentially at risk, and who owes that duty?⁷⁶
- What is nature of the harm (physical injury or death, property damage, or economic losses)?

74. See 495 A.2d at 113; *Clay*, 181 A.2d 545.

75. This discussion of terrorist threats is designed to be illuminating, not exhaustive.

76. This question and the discussion that follows is intended to exclude the perpetrators of a terrorist attack who would be liable parties under any standard.

- How particularly foreseeable is harm, should the duty be breached?
- Was the harm proximately caused by the breach of the duty?

CHEMICAL THREATS

Chemical threats take, at least, two forms: (1) direct attacks on persons using a chemical weapon and (2) direct attacks on the integrity of containers of stored chemicals (e.g., in tanks or pipelines) that are fixed in their location or are in transport.

The most famous and recent example of a direct attack on persons was the release of sarin in the Tokyo subways in 1995 by the Japanese cult, Aum Shinrikyo.⁷⁷ "Twelve people were killed and many more were injured. . . ."⁷⁸

Sarin is one of a handful of chemical agents that challenge the limits of the threat assessment process. The 1999 GAO Report on Combating Terrorism evaluated the threat posed by chemical and biological weapons.⁷⁹ The following chart comes from Appendix I from this GAO Report and considers the likelihood that certain chemical agents will be used in a terrorist attack.⁸⁰ This chart and the entire GAO Report must be viewed in context, however. The report was limited to an evaluation of agents that could "cause mass casualties [in excess of 1,000] by means of improvised weapons or devices and not through contamination of water, food supply, agriculture, or livestock."⁸¹ Plainly, any chemical (or biological) agent that is used in a location likely to result in less than 1,000 casualties is no less threatening.⁸²

77. GAO, Report, COMBATING TERRORISM: NEED FOR COMPREHENSIVE THREAT AND RISK ASSESSMENTS OF CHEMICAL AND BIOLOGICAL ATTACKS, NSIAD-99-163 at 4 (Sept. 7, 1999), available at <http://www.gao.gov/terrorism.html> [hereinafter 1999 GAO REPORT ON COMBATING TERRORISM].

78. *Id.* More deaths were not caused "because of the poor quality of the chemical agent and the dissemination technique used." *Id.*

79. *Id.* at 2.

80. *Id.* app. I at 28.

81. *Id.* at 10.

82. 1999 GAO REPORT ON COMBATING TERRORISM, *supra* note 77, at 9-10.

Chemical Agents⁸³

	<i>Ease of Manufacture</i>	<i>Environmental Persistence/ Stability</i>	<i>Lethality</i>	<i>GAO Observations</i>
Choking Agents				
Chlorine ⁸⁴	Industrial product. No precursors required.	Not persistent.	Low.	Likely agent due to its availability as a commercial product.
Phosgene ⁸⁵	Industrial product. No precursors required.	Not persistent.	Low.	Likely agent due to its availability as a commercial product.

83. 1999 GAO REPORT ON COMBATING TERRORISM, *supra* note 77, at app. I at 28.

84. *Id.* "At room temperature, chlorine is a yellow-green gas with a pungent irritating odor." AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY (ATSDR) MEDICAL MANAGEMENT GUIDELINES, General Information: Chlorine 1, at <http://www.atsdr.cdc.gov/mmg> (last visited Sept. 9, 2002) [hereinafter ATSDR]. Its odor is detectable at concentrations below the OSHA permissible exposure limit so odor will serve as a warning. *Id.* Chlorine is used as bleach, and "as a chemical reagent in the synthesis and manufacture of [many products]." *Id.* at 2. "Chlorine reacts explosively or forms explosive compounds with many common substances such as acetylene, ether, turpentine, ammonia, fuel gas, hydrogen, and finely divided metals." *Id.* at 3. "The toxic effects of chlorine are primarily due to its corrosive properties." *Id.* at 5.

85. 1999 GAO REPORT ON COMBATING TERRORISM, *supra* note 77, at app. I at 28. "Phosgene is used as an intermediate in the [production of] isocyanates, polyurethane, polycarbonates, dyes, pesticides, and pharmaceuticals," among other chemicals. ATSDR, *supra* note 84, Phosgene at 2. "Phosgene is a colorless . . . liquid . . . and a colorless, nonflammable gas above 47° F. At low concentrations, its odor is similar to that of green corn or new-mown hay" ("musty" for those unfamiliar with such odors). *Id.* at 1. "[A]t high concentrations, its odor [is] sharp and suffocating." *Id.* "The odor threshold for phosgene is 5 times higher than the OSHA PEL [permissible exposure limit]" so odor would not provide a sufficient warning of hazardous concentrations. *Id.* Its irritating qualities can be mild and delayed, so exposure for a long period may result before the exposure is realized. *Id.*

	<i>Ease of Manufacture</i>	<i>Environmental Persistence/ Stability</i>	<i>Lethality</i>	<i>GAO Observations</i>
Nerve Agents⁸⁶				
Tabun ⁸⁷	Not readily available manufacturing instructions, but precursors available. Relatively easy to manufacture.	Intermediate.	High.	Likely agent due to availability of precursor chemicals and relative ease of manufacture.
Sarin ⁸⁸	Moderately difficult and precursor chemicals are covered by the Chemical Weapons Convention (CWC). ⁸⁹	Not persistent.	High.	Likely agent due to demonstrated use by Aum Shinrikyo, but restrictions on precursor chemicals could create difficulties for production.

86. 1999 GAO REPORT ON COMBATING TERRORISM, *supra* note 77, at app. I at 28. "Nerve agents are the most toxic of the known chemical warfare agents. They are chemically similar to organophosphate pesticides and exert their biological effects by inhibiting" what are called "acetylcholinesterase enzymes" (thereby producing a toxic level of acetylcholine at nerve synapses which disrupts the transmission of nerve impulses). ATSDR, *supra* note 84, Nerve Agents at 1. The dose and route of exposure are important factors in analyzing the initial effects of nerve agents, but they are readily absorbed and fatal systemic effects can be rapid. *Id.* at 1. "Most of the nerve agents were originally synthesized in [the development of] insecticides, but because of their toxicity, they were evaluated for military use." *Id.* at 2. Tabun was synthesized in 1936 by a German scientist followed by sarin two years later. *Id.* Soman "was synthesized in 1944 by a German chemist, and VX was synthesized in the early 1950s by a British scientist." *Id.* "Nerve agents were used by Iraq against Iran" in their war. *Id.* "They are known to be included in military stockpiles of several nations, including the United States." *Id.* Reversal of nerve agent toxicity depends on the prompt administration of existing antidotes. See also Jeffrey L. Arnold, *Nerve Agents, G-Series: Tabun, Sarin, Soman*, 2 eMedicine Journal, No. 10 (Oct. 16, 2001), at <http://www.emedicine.com/EMERG/topic898> (last visited Sept. 10, 2002); Fergus Nicoll, *VX - one drop is lethal*, BBC News, June 24, 1998, at http://news.bbc.co.uk/1/hi/english/world/middle_east/119136.stm (last visited Sept. 11, 2002).

87. 1999 GAO REPORT ON COMBATING TERRORISM, *supra* note 77, at app. I at 28.

88. *Id.*

89. This Convention has been in force since April, 1997. "According to chemical experts, illegal acquisition of precursor chemicals would raise suspicions and attention due to the provisions of the convention." *Id.* at 11.

