

Design and Practice Issues of NY Harbor considering Unnatural and Natural Hazards

by
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Abstract

Robert Moses, the late and great planner and builder of New York Infrastructure was determined to build a Brooklyn – Battery Bridge in the early 1940's. Like many of Moses' projects, this one did not lack controversy. Eleanor Roosevelt, in her weekly radio program, argued that the bridge would destroy the view. Many of the City and State planners insisted that a tunnel would be better. There were citizen's groups that argued for one or the other. However, it was not until Moses applied for a permit under the Rivers and Harbors Act of 1899 from the Corps of Engineers that he was prohibited from building the bridge. The District Engineer and the Secretary of War under appeal denied the permit because a new bridge would be one more bridge between the Brooklyn Navy Yard and the Narrows that the Axis Powers might attack and block the channel. Thus, the Brooklyn – Battery Tunnel was built (over Moses' objection) instead.

In this paper, we will examine the unnatural threats (lets call them terrorist threats) and more briefly, the natural threats to the Harbor as well as the steps that might be taken to mitigate those threats. We will start with the entrance and Ambrose Channel and move through the interior channels to the landside facilities. Our investigation will address the lower estuary of the Hudson, Hackensack, and Passaic Rivers. There is a substantial threat to interstate and international commerce by obstructing the transportation corridors but more sinister threats to society exist from the weapons that can so easily be transported by sea.



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Introduction – Terrorism Threats

On 9-11-01, the view from upper New York Harbor was as sickening as the view from up town and, like the rest of New York and the Nation, the operation of New York Harbor was changed forever. The war on terrorism is taking many forms. We have the active war, currently focused on Afghanistan and the preventive war focused mostly on airports and the Olympics in Salt Lake City. The purpose of this paper is to focus on the terrorist threat to and by way of the New York Harbor. The threat to the Harbor would be to damage facilities and disrupt interstate and international commerce. The threat by way of New York Harbor would be to use the Harbor as a conduit through which to bring a weapon of mass destruction or some other device into the Metropolitan Region. Both types of threat are creditable. In this paper we shall attempt to define the threats, look at possible ways of preventing the acts, and look at some potential mitigation measures. Much of this paper will be speculation. There are numerous agencies charged with various functions that intersect with the prevention of terrorism in the Harbor. The New York Police Department is charged with basic law enforcement. Since interstate commerce is involved in the operations of the Harbor, Federal law enforcement agencies also have roles. The Immigration and Naturalization Service is charged with illegal immigration through the Harbor. The Environmental Protection Agency oversees pollution. The U.S. Army Corps of Engineers is charged with maintaining interstate waterborne commerce and regulating the construction of structures, dredging, and the dumping of fill in New York Harbor. Finally, the U.S. Coast Guard has the waterside traffic and smuggling prevention tasks. There are also other local agencies that are involved to lesser extents in governing the activities in the Harbor. There is no centralized control of the efforts of all agencies in the Harbor. The Corps of Engineers functions as the Supervisor of the Harbor. The Coast Guard functions as Captain of the Port. But there is no overall integration of activities associated with terrorism prevention. An extremely small amount of cargo that arrives in the Port of New York and New Jersey is inspected.

The Threat

Figure 1 is a chart describing the general location of all the channels into New York Harbor. The main channel from the Atlantic Ocean is Ambrose Channel. This channel allows vessels to enter the upper harbor through the Verazano Narrows, move north up Buttermilk Channel into Brooklyn facilities, or mover northwest into Port Jersey on the Bayonne peninsula, or move west through Kill Van Kill into Newark Bay for Port Newark and Port Elizabeth. Lesser channels allow passage north on the Hudson and East River or from the Ocean up Arthur Kill to Howland Hook and other stations.



Figure 1 New York Harbor Federal Channels *Courtesy U.S.A. Corps of Engineers*

Major vessels with drafts of 35 to 45 feet regularly navigate these channels bringing cargo from all over the world. CNN has reported that less than 3% of all containers brought into the port are inspected. It is extremely doubtful that a tactical nuclear weapon would be discovered shipped into this country in a container as shown arriving in figure 2. This brings up the major terrorist threat to the region, as I see it. That is having weapons of mass destruction delivered to the Harbor in container ships. Containers are of sufficient size that almost any type of mass destruction weapon could be housed inside and almost completely concealed. For instance pallets of goods are traditionally stacked from floor to ceiling in containers. Inspectors have to use forklifts to remove goods to inspect the interior of a container. It would be very easy to conceal a nuclear munition in the interior of one of these containers. They are generally 40 feet long and may contain anything. Automobiles are traditionally shipped in containers, as are food stuffs, dry goods, furniture, construction materials, chemicals, etc. The bombs dropped on Japan in WWII were 1/3rd the size of an automobile. In the past half century, nuclear demolition munitions have certainly improved. Although specific changes are classified, one can surmise that they are certainly smaller, easier to operate, more convenient to transport.



Figure 2. Container vessel arriving into Port. *Courtesy PANY/NJ.*

The traffic in containers has been increasing over the years. Figure 3 shows the increase in container traffic over the past decade or so. Since containers come in several sizes, the upper bar converts all to “twenty-foot equivalent units (TEU’s) for consistency.

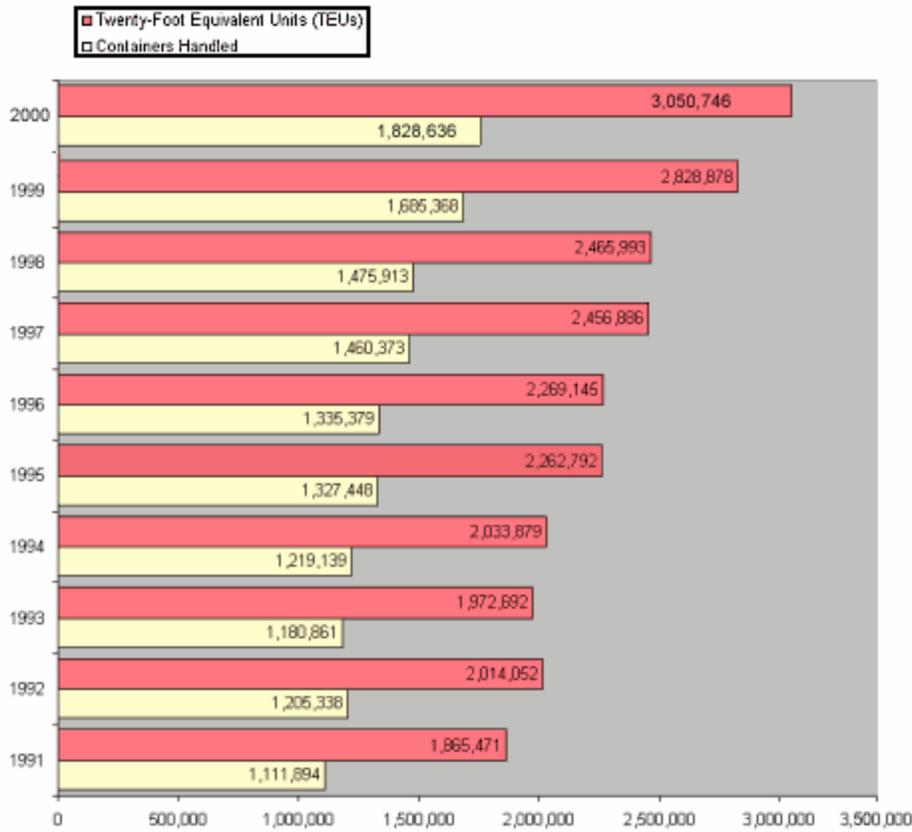


Figure 3. Containers handled in the Port of NY and NJ 1991 – 2000 *Courtesy PANY/NJ*

Other containerized threats. Most other major threats to the Harbor pale in comparison to the first major threat. A low (or high yield) nuclear weapon imported by container in the form of nuclear demolition munitions would be catastrophic to the region. Other threats include importing by the same method chemical and biological weapons, a dastardly proposition but much more difficult in that transport mechanisms from containerized smuggling would not differ greatly from other transport mechanisms. Conventional and perhaps “dirty” munitions might also be brought in by way of container cargo. Again, their transport and deployment would get no special advantage from the Harbor as a point of entry.

Other forms of threat. With the large number of ships entering the Harbor, it is not difficult to imagine a creative terrorist having sufficient wealth backing from using a ship as a vessel to transport terror weapons. In all likelihood, the transport of nuclear weapons in the hold of a vessel would be less likely than in a container, but not out of the realm of possibility. It is far more likely, I think, that conventional explosives, agents, or chemical and biological weapons might be transported as more conventional cargo.

Threats to Port Facilities.

Figure 4 shows the facilities of the PANY/NJ. The most important cargo facilities in the Harbor are :



Figure 4 PANY/NJ Facilities. *Courtesy PANY/NJ*

Port Newark and Port Elizabeth, the largest container cargo facilities; Port Jersey Auto Marine Terminal; Howland Hook, petroleum products; Brooklyn Marine Terminal; and Red Hook Container Terminal. The vulnerabilities of these terminals are damage to the land side facilities and damage to the waterside facilities. For the land side, the threat is to cargo handling facilities, cargo staging areas, and cargo transporting facilities such as rail and roadway facilities (bridges and tunnels). The threat to the waterside facilities are damage to docking facilities, turning basins, anchorages, and channels. All of these are susceptible to traumatic damage from high explosives or nuclear explosives. Major damage to land side facilities is unlikely due to the sprawling nature of the facilities. To be effective, damage must be to specific equipment or choke points. As far as the waterside goes, major damage would be very difficult to inflict with anything but a huge amount of conventional explosives or a fair-sized nuclear device.

Like the War Department during the WWII, we much think of damage that would close the Harbor to shipping. Damage to the Verazano Narrows Bridge to the extent that it blocked the entrance to the Harbor from Ambrose Channel is a threat. The probability of this threat is not great in that degree of difficulty in dropping the bridge is very great making the probability of occurrence small and the consequences are such that the channel could be cleared in a matter of weeks if not days. A more probable scenario is the sinking of a vessel in one of the major channels in the Harbor. However, this also could be cleared in a matter of weeks.

The Prevention of Terrorist Activities

As discussed earlier, the major threat is defined as the act of smuggling a nuclear device into the Harbor in a 40-foot container. This container may be off-loaded in Port Newark, Port Elizabeth, or Red Hook Container Terminal. The only effective prevention measures to prevent such smuggling are:

1. Inspection at the Port of Embarkation, or
2. Inspection at the Port of Debarkation.

Unfortunately, before the disaster on September 11, 2001 inspection services had been severely reduced as economy measures. The Coast Guard had cut back its operations roughly 30% (NWSsource.com, May 29, 2001) and the Immigration and Naturalization Service experienced similar cutbacks. After 9/11, more attention is being paid to anti-terrorism efforts; it is yet to be seen as to their effectiveness. One would hope that research could develop other means of preventing smuggling in containers; however, this author knows of none.

Other threats such as non-nuclear explosives and chemical and biological weapons can be prevented in the same manner as the nuclear devices. They require inspection of each container that may likely transport terrorism agents. The number of inspections required might be reduced by targeting the containers from destinations the U.S. Department of State designate as potential terrorism countries. However, the current brand of terrorist have the capabilities of moving from country to country, a move that would mitigate a targeting scheme.

The Mitigation of Terrorist Activities

New York Harbor is blessed with being cited in the Metropolitan region with some of the most capable marine and contracting companies in the world. Companies and agencies can have contractor response within hours to emergencies in the Harbor. Witness the activities of 9/11. Marine contractors were on site within hours of the disaster. Engineers from all over the region were volunteering their services. This does not include the substantial capabilities of government agencies at the local, state, and federal levels, again as evidenced on 9/11.

Mitigation of the greatest threat, that of a nuclear munition being delivered in a container depends upon where the device is detonated. It is doubtful that the device would be detonated in the Harbor at the container port. Its devastation could be much greater if it were transported into a more significant area. Regardless of where it is detonated, there is little mitigation impact available. Depending on the circular area of damage and the radioactivity and its half-life, areas near the nuclear detonation will be wasteland for years to come. Needless to say, interstate and international commerce will be disrupted.

Mitigation of a chemical or biological attack is again a fairly moot point. Mitigation would be aimed at reducing casualties and protecting the population. A modest attack as seen in the Anthrax letters would do little to affect the Harbor. A major dispersion of an agent from one of the port facilities could render the port useless for a long period of time. Again, this could cause considerable disruption to interstate and international commerce.

The easier to visualize and cope with type of attack, that of obstructing navigation channels, is easier to mitigate. There is little that terrorist could do to put the port out of commission for a long period of time using conventional methods. Blocking a channel could close some of the port facilities for a matter of days or weeks. Blocking the Narrows would have the most effect on the port since this would require the use of the channel through Arthur Kills, a considerably smaller channel, to be used. However, the Narrows' channel is over 70 feet deep naturally and would be extremely difficult to block. Dropping the bridge into the channel would be very hard to do; it could also be removed fairly rapidly. Sinking a ship precisely in the Narrows would also be hard to do; the channel would be closed slightly longer but not significantly. Blocking individual channels to the various port facilities would be easier than the Narrows' channel but the impact would be a single or perhaps, in the case of Port Newark and Elizabeth, two facilities closed. However, the channels could be opened in days or weeks. Damage to the quays or landside of port facilities again would be no major problem. Almost any imaginable damage by conventional explosives could be mitigated in days or weeks. Some mechanical equipment might take longer to replace. Agencies and methodologies to handle any conventional mitigation in the Harbor is readily in place on a daily basis.

Natural Threats to the Harbor

There are always natural threats to the Harbor. Hurricanes and other storms, earthquakes, fires, oil spills, other pollution and impacts of asteroids. However, these natural threats exist every day and are dealt with on a routine basis. There are standard procedures dealing with oil spills and other pollution. As a matter of fact, the past three decades are real success stories for NY Harbor and the lower Hudson estuary in dealing with water pollution. In the early 1960's, the water in NY Harbor was milky with visibility of a few inches. The water was a biological wasteland. However, since the water pollution legislation of the early 1970's (PL92-500 and PL92-532), the waters have cleaned to the point that 10 feet visibility is not uncommon; fish and other fauna abound in the harbor, and the water is becoming cleaner each day. Its real forms of pollution are the General Electric transformers in the upper Hudson emitting PCB's, the combined sewer overflows in the Hudson, Passaic, and Hackensack Rivers, and the sheet runoff along the Hudson River and the harbor. Oil spills and other form of illegal discharges are handled on a routine basis.

Fires are always a threat to any facility. The threat to the Harbor facilities are no more than to any other facilities. I feel the same for earthquakes. A major plate disturbance in the Metropolitan region would be disastrous. Probably less of a disaster to port facilities since most are relatively low-rise facilities, they are spread out and facility components are not so susceptible to damage. Similarly, impacts by asteroids, we hope, have a slight probability of hitting NY Harbor, but a high potential for major destruction. Interstate commerce and international commerce would probably rank among our smaller problems.

Hurricanes and other storms are another matter. While the impact of other natural disaster should be played down in my estimation, the impacts of storms, particularly hurricanes, are of special interest to NY Harbor and all of New York City for that matter. The storm surge of a category 4 or 5 hurricane hitting NY Harbor at high tide will be devastating. One could expect a storm surge of 20 to 30 feet that would inundate all port facilities as well as the southern 30% of Manhattan. A major disaster would occur in that all subways would be flooded, basements of all lower Manhattan buildings would flood. Power and communications would be significantly disrupted. The port facilities, mostly landside, would require major efforts to return waterborne commerce to the area.

Summary

This paper has briefly discussed the unnatural and natural disaster potentials for New York Harbor. In discussing the unnatural (terrorist) potentials, we determine that the most disastrous potential is the act of importing a weapon of mass destruction by container into the harbor for detonation in the harbor or else where. The potential for this threat is rated as high as the mechanisms are not in place at present to prevent it. By weapon of mass destruction we mean a nuclear demolition munition of high to medium yield. Other potential threats are other types of mass destruction weapons of a chemical and biological nature. While a real threat, this type of weapon is not a harbor specific weapon. We concluded that conventional explosives were a real threat to the harbor. However, we feel that the capability exists within the resources of the various agencies dealing with the Harbor to mitigate these threats and keep the Harbor open for interstate and international commerce. The only natural threat that we considered a major threat to the harbor is a category 4 or 5 hurricane hitting at high tide and moving rather slowly. This has the potential to wreak havoc on the entire City of New York.

References

U.S. Army Corps of Engineers web site.

Port Authority of New York and New Jersey web site.

Author Biography

F.H. (Bud) Griffis is Professor and Chairman of the Department of Civil Engineering and Director of the Center for Construction Management Technology, Polytechnic University. He is also Professor *Emeritus* of Civil Engineering from Columbia University. He is Executive Vice President of Robbins, Pope and Griffis Engineers, P.C. of New York City. Before joining academia, he was Commander and District Engineer of the U.S. Army Corps of Engineers New York District. Before that assignment, he was Area Engineer and Contracting Officer for the design and construction of Ramon Airbase, Israel. Before that time he held command and staff positions in Corps of Engineers units in Viet Nam, Germany, Korea, and Israel. He has a PhD in Civil Engineering (Construction) from Oklahoma State University and is a registered professional engineer in the State of New York. He is a Fellow in the American Society of Civil Engineers having served as a National Director and President of the Metropolitan Section, ASCE. He is also a Fellow in the Society of American Military Engineers serving as a National Director and President of the New York City Post. He is currently President of the New York City Post, SAME, Scholarship Fund, Inc. He is the author of numerous technical papers and two textbooks.