

Case A. For WTC 2, Case D involved more severe impact and fire conditions than Case C. The results of the two cases for each tower provided some understanding of the uncertainties in the predictions.

There were substantial uncertainties in the as-built condition of the towers, the interior layout and furnishings, the aircraft impact, the internal damage to the towers (especially the insulation), the redistribution of the combustibles, and the response of the building structural components to the heat from the fires. To increase confidence in the simulation results, NIST used information from an extensive collection of photographs and videos of the disaster, eyewitness accounts from inside and outside the buildings, and laboratory tests involving large fires and the heating of structural components. Further, NIST applied formal statistical methods to identify those parameters that had the greatest effect on the model output. These key inputs were then varied to determine whether the results were reasonably robust.

The combined knowledge from all the gathered data and analyses led to the development of a probable collapse sequence for each tower,¹³ the identification of factors that contributed to the collapses, and a list of factors that could have improved building performance or otherwise mitigated the loss of life.

6.2 DEVELOPMENT OF THE DISASTER TIMELINE

Time was the unifying factor in combining photographic and video information, survivor accounts, emergency calls from within the towers, and communications among emergency responders. The visual evidence was the most abundant and the most detailed.

The destruction of the WTC towers was the most heavily photographed disaster in history. The terrorist attacks occurred in an area that is the national home base of several news organizations and has several major newspapers. New York City is also a major tourist destination, and visitors often carry cameras to record their visits. Further, the very height that made the towers accessible to the approaching aircraft also made them visible to photographers. As a result there were hundreds of both professional and amateur photographers and videographers present, many equipped with excellent equipment and the knowledge to use it. These people were in the immediate area, as well as at other locations in New York and New Jersey.

There was a surprisingly large amount of photographic material shot early, when only WTC 1 was damaged. By the time WTC 2 was struck, the number of cameras and the diversity of locations had increased. Following the collapse of WTC 2, the amount of visual material decreased markedly as people rushed to escape the area and the huge dust clouds generated by the collapse obscured the site. There is a substantial, but less complete, amount of material covering the period from the tower collapses to the collapse of WTC 7 late the same afternoon.

¹³ The focus of the Investigation was on the sequence of events from the instant of aircraft impact to the initiation of collapse for each tower. For brevity in this report, this sequence is referred to as the “probable collapse sequence,” although it does not actually include the structural behavior of the tower after the conditions for collapse initiation were reached and collapse became inevitable.