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Analysis of First-Person Accounts from Survivors of the World Trade Center Evacuation on September 11, 2001

Guylène Proulx, Rita F. Fahy and Amber Walker

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EXECUTIVE SUMMARY

In the days following events at the World Trade Center on September 11, 2001, the National Fire Protection Association (NFPA) and the National Research Council of Canada (NRC) decided to collaborate in collecting survivors' accounts to document the event. First-person accounts were collected from newspapers, radio and television programs, e-mail exchanges and a variety of websites. Additional accounts were provided by NIST. Over a period of 18 months, a total of 745 first-person accounts were collected. These accounts had been published up to 14 months after the event. Although media accounts are not necessarily reliable accounts of events, and certainly do not provide the scientific rigor of a proper study, they do present important insights into the events of the day. The large number of accounts found, the level of detail in some of these accounts as well as their time of publication, which is much closer to the event than any human behavior and evacuation research could be conducted, supported the decision to conduct an analysis of the first-person accounts.

The objectives of the analysis of the first-person accounts were to gain insight into the variability of human behavior and response time displayed during the evacuation, with the findings to be used as a guide for future research. Data gathered would help to create a better understanding of individual experiences of occupants in specific locations by documenting, to the extent possible, the information available to the person, the conditions on their floor and along their evacuation route.

To analyze the content of the first-person accounts, a questionnaire tool was developed and used to 'interview' each account. The questionnaire had 33 questions such as: "On what floor was the person?," "What was the first cue of the event?," "Was the person injured?," "What were the conditions in the stairs?." Not every account provided answers for all 33 questions, since some accounts lacked certain details, but this is similar to a respondent who did not answer some questions in a survey. All the accounts were reviewed independently by two researchers who summarized the responses into a matrix. When completed, the matrix summaries were compared, and any discrepancies were discussed and resolved. Once the 745 first-person accounts were summarized, multiple accounts from the same person were merged into one, which provided accounts for 465 individuals. (Some survivors provided multiple accounts to different journalists.)

Based on the responses to each question, a coding scheme was developed and each individual's account was coded. Before any analysis began, the database was further limited to the 435 civilians who were in either WTC 1 or WTC 2 at the World Trade Center on that day.

In summary, the accounts analyzed were from 435 individuals; 251 occupants of WTC 1 and 184 occupants of WTC 2. They represented the three different floor strata of the 2 towers. The accounts were mainly from men (314 vs. 118) and from people varying in age from 20 to 89 years old. Among the interesting results found was the means of egress used that morning. Out of 158 people who mentioned their means of egress in WTC 2, 18 used the elevators and 26 used a combination of stairs and elevators to leave the tower. It was found that the higher the person was located in the tower initially, the more likely it was that this person used an elevator to evacuate. In WTC 1, out of 202 people who mentioned their means of egress, 198 used the stairs, one used an elevator and three used a combination of stairs and elevator. This does not include the 22 people who were stuck in elevators when WTC 1 was hit. The most common adverse floor condition mentioned by people in WTC 1 was the presence of smoke (mentioned by 74 people), debris or collapsed walls, ceilings or floors (72 people) and fires (41 people).

In WTC 2, 37 people reported debris or collapsed walls, ceilings or floors on their floor and 25 people saw smoke.

The most prevalent condition reported for the stairwell was that it was crowded and hot (mentioned by 106 people). A particular condition mentioned for the stairs in both towers was the presence of smoke, mentioned by 78 people in WTC 1 and 29 in WTC 2. The presence of water, usually on the lower stairwell floors, was mentioned by 49 people in WTC 1 and four people in WTC 2. Jammed or locked doors were mentioned by 20 people in WTC 1 and two people in WTC 2.

In WTC 2, 96 people mentioned hearing a message over the communication system to 'stay or return to their office.' The majority of them, 69 people, decided to disregard the instructions and continued their evacuation. The 16 people who decided to remain in their offices or decided to turn back didn't have time to travel very far before the second plane hit; at that point they all resumed their evacuation down.

Overall, 154 mentioned that others were calm. The 41 people who were present at the World Trade Center on the day of the bombing in 1993 indicated that they were better prepared this time to face the emergency. This past experience, they said, made them readily start their evacuation.

Among the accounts analyzed, 27 people reported having a disability and 47 were injured that morning. All these people were supported in their evacuation by coworkers. Half of them stated that they started their evacuation immediately and one-third mentioned some delay to get organized and seek first-aid. Several people who were disabled or injured evacuated the towers swiftly as occupants formed a single line to let them through rapidly down the stairwell. Many people (143 in WTC 1 and 26 in WTC 2) mentioned being reassured and felt safe when meeting firefighters in the building. Although the emergency crews disrupted the evacuation in the stairwell by going against traffic, the people appreciatively cheered them on. Several people, 151, made calls to family and friends to give and obtain information, 20 people called their bosses or colleagues and another 12 people made calls to authorities. Another 14 people used e-mail wireless technology and pagers to exchange information, which seems to be the only reliable devices used from inside the stairwells.

It should be acknowledged that content analysis of first-person accounts has important limitations. Essentially, the questions asked by journalists are usually unknown, questions might vary from interview to interview. Further, some details might be left unreported and the most dramatic stories might be over represented. Consequently, the results cannot be generalized to the overall population of the towers of the World Trade Center. Results of this analysis are useful for documenting some specific details that should be investigated further, using a scientifically recognized methodology to obtain generalizable data.

Analysis of First-Person Accounts from Survivors of the World Trade Center Evacuation on September 11, 2001

G. Proulx , R.F. Fahy, and A. Walker

1.0 INTRODUCTION

At 8:46 a.m. on Tuesday, September 11, 2001 American Airlines Flight 11, a hijacked Boeing 767, hit WTC 1 of the World Trade Center. This impact instantly devastated four floors, from 94 to 98 of the 110-story high tower, trapping those above. Sixteen and a half minutes later, at 9:03 a.m., a second hijacked Boeing 767, United Airlines Flight 175, struck WTC 2 of the World Trade Center, which took out seven floors, from 78 to 84 (FEMA BPAT, 2002).

Despite the massive localized damage caused by the impact, each structure remained standing. However, as each aircraft impacted a building, jet fuel on board ignited. Part of this fuel immediately burned off in large fireballs that erupted at the impact floors. Remaining fuel flowed across the floors and down elevator and utility shafts, igniting intense fires throughout upper portions of the buildings. As these fires spread, they further weakened the steel-framed structures, eventually leading to total collapse (FEMA BPAT, 2002).

Although the events of September 11, 2001 involved the World Trade Center, the Pentagon and the hijacked airliners, the evacuation of the two towers was the focus of this research. The attacks precipitated the evacuation of the entire World Trade Center complex. The evacuation of WTC 1 and WTC 2 was largely initiated by the occupants themselves, since no formal instructions were issued immediately following the first attack.

At 9:59 a.m. WTC 2, the second to be hit, collapsed after burning intensely for 56 minutes. WTC 1 withstood its injury longer than the South tower, collapsing to the ground at 10:28 a.m. after burning for 102 minutes (FEMA BPAT, 2002). It is estimated that approximately 2,800 people were killed and 800 others injured by the attacks and eventual collapse of the towers on September 11, 2001 (Cauchon, 2001).

The World Trade Center was a complex of seven buildings, with the two 110-story office towers joined at sidewalk level by a 22-story hotel. Approximately 50,000 people worked in each tower (100,000 total), with an estimated 70,000 visitors to the complex during the course of a normal business day (Yamasaki, 2002). However, the occupancy of the towers on the morning of September 11, 2001 was not at its maximum capacity. According to *USA TODAY*, 5,000 to 7,000 people were in each tower at 8:46 a.m. that morning, the time of first impact (Cauchon, 2001). It has been suggested that the towers were not at their maximum capacity for several reasons. That morning marked New York City's mayoral primary and it is assumed that many people stopped to cast their ballots before heading in to work. The New York Stock Exchange does not open until 9:30 a.m., therefore many people from trading firms had not come into work yet. Tuesday, September 11, 2001 was the first day of school in several primary school districts and many parents accompany their children to school on this day. Visitor hours had not started yet, as the viewing platform in the South Tower did not open to the public until 9:30 a.m. Perhaps the biggest factor of all was the early hour – many simply had not arrived to work by 8:46 a.m. In addition, dozens of Asian investment firms in the World Trade Center had closed their offices or cut employment

sharply due to the recession in Asia. Some offices were leased but empty or under renovation (Cauchon, 2001).

The evacuation of the World Trade Center on September 11, 2001 was a success. Under the impacted floors, nearly everyone who could physically get out did get out. According to *USA TODAY*, in each tower, 99% of the civilian occupants below the crash sites survived. Their analysis shows that two-thirds of WTC 2 occupants started their evacuation of the upper floors during the 16.5 minutes between the attacks, and survived. Among the employees of the World Trade Center, under the impacted floors in WTC 1, 72 people died, where as under the impacted floors in WTC 2, 4 people died (Cauchon, 2001). It is assumed that half, if not more, of the deaths below the impacted floors in WTC 1 occurred in the elevators, which were carrying people at the time of impact.

In the days following the tragedy, the National Fire Protection Association in collaboration with the National Research Council of Canada decided to collect survivors' stories to document the event and to use this background material to develop future studies on occupant behavior during the evacuation of the World Trade Center. First-person accounts were collected from newspapers, radio and television programs, e-mail exchanges and a variety of websites. Additional accounts were received at a later date from NIST. This large quantity of material was coded and analyzed to obtain a better understanding of the personal evacuation experiences of different survivors located on the different floors of the two towers.

2.0 LITERATURE REVIEW

Understanding the basic concepts of human behavior in fire is necessary to envision occupants' likely response during an emergency. Human behavior in fire is a scientific field that identifies facts, concepts and relationships established through systematic observation and experimentation. What is known about human behavior in fire is that the three dimensions of the emergency, namely the occupant, building and fire characteristics, interact to explain or predict occupant response to fires (Proulx, 2001).

During a fire, the nature of the information obtained, the limited time to react and the assessment of danger will create a feeling of stress**.** This stress is not an abnormal reaction; on the contrary, stress is regarded as a necessary state to motivate reaction and action. During the course of the event, the intensity of stress experienced will vary as a function of the information newly-perceived and the assessment of the decision taken (Proulx, 1993). Key factors which increase stress include: the perception of threat to oneself or others, the suddenness of the threat and the available time to respond or prepare, the amount of sensory input needed to be processed, and the degree of physical effort (aerobic and anaerobic output) that is engaged during the incident. If the individual is physically wounded or injured, the effect will be even greater (Grossman, 2002). Taking all of these factors into account, it can be said that most evacuees of the World Trade Center were under extremely high levels of stress.

Most people assume that individuals cease to act in a predictable, orderly fashion in the face of disaster, and that norms which govern our behavior collapse into Durkheim's anomie, a state of normlessness (Fisher, 1998). This mindset, known as *disaster mythology* has been greatly nourished by the mass media and movie industry who like to capitalize on strong emotional images (Proulx, 2002). Today, it is largely known that in the face of the extreme stress of a disaster, there is an *absence* of widespread, irrational, antisocial and dysfunctional behavior that has often been described as 'panic' (Quarantelli, 1998). Thus, the false but common belief that people will panic in disaster situations is a myth, yet it is fuelled by the constant and sometimes exaggerated media coverage of certain crises. In human behavior fire research it

is found that panic behavior is extremely rare (Proulx, 2002). Decision making during an emergency is, however, different from day to day decision making for three main reasons (Janis & Mann, 1977). First, there is much more at stake in emergency decisions – often the survival of the person and of the people he or she values the most is at risk. Second, the amount of time available to make a decision before crucial options are lost is limited. Third, the information on which to base a decision is ambiguous, incomplete and unusual, further it is usually impossible to look for more appropriate information due to the lack of both time and the means to get information (Proulx, 1993).

Turning to the literature of the evacuation of the World Trade Center following the 1993 terrorist bombing, it was concluded that there was a lack of panic flight during the evacuation, even though the occupants had to descend the crowded and smoky stairwells in total darkness. No official evacuation orders were issued by recognized emergency and building officials after the explosion and no official information was provided about safe or proposed exit routes. However, it was found that there was an overall mood of orderly evacuation during the 1993 evacuation (Wenger et al, 1994; Fahy & Proulx, 1995). This lack of panic during the 1993 evacuation may be explained by the fact that although the explosion created immediate danger, it was not perceived by participants as particularly severe. Secondly, people were not alone; they were with coworkers, friends and associates. The web of social integration among participants works against the adoption of norms that would support individual, competitive flight behavior to favor the emergence of cooperative, altruistic, helping and orderly behavior (Wenger et al, 1994).

In contrast to the panic scenario of a competitive scramble towards an exit, Sime (1985) argues that the most common behavior during a fire is movement towards familiar persons and places. This is known as the *affiliation* model which suggests that detached groups will attempt to reunite before evacuating and evacuation movement is most likely to be through a familiar way in and out of the building (Sime, 1985). The grouping of people during an emergency is sometimes known as the *milling process*: the communication process that takes place among participants in a crisis setting as they attempt to define the situation, propose and adopt new appropriate norms for behavior and seek coordinated, collective action (Wenger et al, 1994). High levels of social interaction were reported during the 1993 evacuation as the tenants engaged in milling behavior regarding the definition of the situation, the attempt to give meaning to a crisis (i.e. to determine "What is happening?"), and the appropriate response to it or proposed cues for action, and the attempt to give direction to the behavior of the participants by offering new, emergent norms (i.e. "What should we do? What is appropriate?") (Wenger et al, 1994).

Identification of the information available to occupants in defining the situation is essential in attempting to understand the decision making process during an emergency. The social context of the occupants and the opportunity to observe and interact with others are also fundamental considerations when attempting to understand the occupant response and overall outcome of evacuations.

3.0 RESEARCH OBJECTIVES

This exploratory research project was conducted in order to gain an overall understanding of the circumstances surrounding the evacuation of the World Trade Center towers on September 11, 2001. More specifically, this research project endeavors to gain insight into the variability of human behavior and response time displayed during the evacuation, with the findings to be used as a guide for future research. Human behavior data gathered from this project will help to create a better understanding of the individual experiences of occupants in specific locations by documenting, to the extent possible, the

information available to occupants, such as conditions on their floor and along their evacuation route, perceived behavior of others and escape conditions and timing.

4.0 METHODOLOGY

In the moments following the attack of the World Trade Center towers on September 11, 2001, journalists started interviewing survivors to obtain the story of their evacuation. These first-person accounts were presented on television or radio and published in newspapers, magazines, or websites and later reported in books and special media programs. During the three months following the events, over 280 first-person accounts were collected. The information provided, in some of these accounts, was so detailed that it provided sufficient material for a study. Additional accounts were gathered over the next year for a total of 745 first-person accounts from 465 individuals, as some survivors provided multiple accounts to different journalists. The 435 accounts retained for analysis are from evacuees of the WTC 1 and WTC 2 only, and although numerous accounts were found from occupants of the surrounding World Trade Center complex, only those civilians who had evacuated the actual towers were considered. For those survivors for whom numerous accounts were found, the information across the accounts was collapsed into one highly detailed account, containing the combined information from all of the given accounts. For instance, 16 survivors provided five to 12 different accounts to the media. These survivors had dramatic accounts and therefore the media was very interested in publishing their stories.

It is recognized that the use of first-person accounts published in the media as main sources of information for a study has many limitations. The questions asked by reporters are unknown and can be different from each journalist or with each interview. It is also noted that the date an account was published does not necessarily represent the date that the specific interview took place; the account could have been held at some point and then published at a later date. It is suspected that the most dramatic experiences are reported and that some information may be emphasized or left unreported for the purpose of the article. Over the last 50 years the mass media has greatly reduced the level of flamboyant exaggeration in what they report as typical behavioral and organizational response to disaster. However, since a larger portion of the news is now devoted to reporting disasters, a less than accurate image is still commonly portrayed both in the print and broadcast media (Fisher, 1998). It also must be stressed that the findings are representative of the sample; individual experiences captured in first-person accounts cannot be generalized to the population of the two towers.

It has been said that traumatic situations will inevitably result in memory impairment or “critical incident amnesia.” The greater the stress, the greater the potential will be for memory problems to occur. Immediately after experiencing a critical incident, individuals have not had an opportunity to mentally process and refine what they have experienced. However, it has been proposed that after a night’s sleep there should be significant memory recovery. If an individual has been isolated from other sources of information, the memories at this point (approximately 24 hours after the incident) should be the most “pure,” since witnesses have not yet integrated data from other sources (Grossman, 2002). However, with the intense media attention that the events of September 11, 2001 received, it is highly likely that this coverage influenced survivor’s recollection of events. This phenomenon, referred to as ‘contamination,' occurs when information outside of the actual experience is integrated into the reconstruction of memory (Grossman, 2002). Thus, it is important to recognize these effects as possibly influencing the validity and reliability of the first-person accounts gathered from media sources over a period of 18 months.

In the face of the drawbacks of using media sources for the basis of research, some of the accounts contained such a high level of detail, particularly the ones written by survivors themselves, they provided justification for the analysis of this information. It should also be stressed that these media accounts are the only documented descriptions of the World Trade Center evacuation and immediate reactions of the survivors, as no research has been conducted or published 2 years after the events, regarding human behavior surrounding the events of September 11, 2001. Since documenting human behavior is time sensitive and considerable time has passed since the event, it may be said that these initial media accounts may hold more detailed and accurate information than any future survey questionnaire or interviews could gather.

4.1 Content Analysis

The most appropriate social research method for analyzing media communications is content analysis. To extract the important content from the accounts a 'questionnaire' was developed to 'interview' each account. This procedure was used by Johnson (1987) to analyze police file statements related to the "Who Concert Stampede"; it is also explained in some detail in Gamson's book "The Strategy of Social Protest" (1975). The approach relies on a series of identical questions used to interview each document. Once the information is gathered in a qualitative or descriptive database, codes are developed to reduce the variety of answers to each question to a manageable number. To ensure reliability of the coding, at least two researchers independently review each account and compare their coding. Any disagreement is discussed and resolved.

Questions to 'interview' each account were designed to obtain manifest and latent information from the 745 first-person accounts. A majority of the questions, 30 of them, rely on manifest information or elements specifically reported in the account, such as the person's location at certain key moments. They are listed in Table 1. The remaining three questions called for latent information, such as words describing emotions. They are listed in Table 2. Data was retrieved from the accounts and entered into a qualitative database. Nominal and ordinal categories were conceptualized which can be found in the coding scheme presented in Appendix A. It is important to note that not all questions were answered for each account gathered, as several accounts were incomplete. For those questions not addressed in the account, the category was awarded the code '9' or '99,' accounting for the lack of information regarding that specific question. This lack of information for some items is the equivalent in a questionnaire survey to a respondent who did not answer some of the questions. The information gathered in the qualitative database was coded and transformed into a quantitative matrix from which descriptive statistics were calculated.

It is important to note that the fact that an individual's account is silent on some point does not mean that this factor was not important or relevant in that individual's evacuation. It simply means that it was not included in the published account or that it was never mentioned by the individual.

4.2 Variables Considered

Conceptualization and operationalization involved precisely defining how the variables were measured and ensuring the attributes within those variables are mutually exclusive and exhaustive. There were 33 questions providing data ranging from demograhics and physical location to response time and social interaction during the evacuation. Coded data included the evacuees' gender, age and which building and floor they were located in as well as the date the account was published. The floors of the towers were categorized as lower (basement to 42rd floor), mid (43th to 76th floor) and upper (77th to 110th floor) based on the common areas referred to as 'skylobbies' on the 44th and 78th floors, which separated the towers

Table 1. Questions on Manifest Information.

What is the date of published account?	Heard fire alarm?
Gender?	Location at WTC 2 impact?
Age?	Location at WTC 2 collapse?
In which building was the person at the time of first cue?	Location at WTC 1 collapse?
On what floor was the person?	Location when met firefighters?
What was the first cue of event?	At what time person exited the building?
How long did the person take to start evacuation?	Who helped person during evacuation?
Did the person delay start time?	Was the person disabled?
What mode of egress was used?	Was the person injured?
What was the condition on floor?	Location when person placed phone call?
What was the condition on the stairs?	Who was the phone call recipient?
Were obstructions encountered during evacuation?	Was there social influence on decision making?
Heard announcement?	Use other (non-phone) communication technology?
Location when WTC 2 announcement heard?	Was person at the WTC during 1993 bombing?
Action after hearing WTC 2 announcement?	Did the person rest during evacuation?

Table 2. Questions on Latent Information.

What was the person's knowledge of the situation in the initial moment?
How serious did the person judge the situation to be?
What was the person's perception of others?

into three strata. The skylobbies on 44 and 78 served the occupants of the 43rd and 77th floors, respectively. Mode of egress was recorded as stairs, elevators or a combination of both.

The first cue of the event was categorized according to whether the cues were ‘audio,' such as hearing an explosion, crash or rumbling; 'visual,' such as seeing the plane approach the towers or seeing fire, smoke or debris. Another category of first cue was ‘building movement’ and was represented by feeling the building shake, sway or tremble, where as moving office furniture, falling ceilings, jolting in the elevator and flickering lights were attributes of the variable category ‘contents movement.' The remaining three categories were 'warned by others' (either verbally or through their behavior), physically impacted' (e.g., burned, fell from chair, thrown against wall) and 'smelled smoke or fumes or felt heat.' These cues were coded as check-off items so that multiple initial cues could be captured. Whether or not evacuees heard a building alarm during their evacuation was recorded in a separate field, if mentioned.

Time to start evacuation was recorded as ‘immediately,' ‘shortly after’ impact (where the occupant took less than 5 minutes to retreive belongings before evacuating), ‘delayed’ (representing those who took

more than 5 minutes to start evacuating, taking time to search floors or gather company documents, etc.), ‘stayed’ or ‘stuck.'

Conditions of floors when the building was hit were recorded in two ways. One field summarize the conditions as follows: ‘devastated,' meaning combinations of conditions such as scattered debris, fire, darkness and fallen ceilings and walls were reported; ‘abnormal,' in that there was some smoke, heat or the smell of jet fuel; and ‘normal,' represented by accounts describing usual conditions on their floors.

A series of check-off columns then recorded whether a person’s account reported the presence of specific conditions: door jammed, debris (e.g. from wall, floor or ceiling collapses), smoke, dust, no power or darkness, smell of fumes, water, fire, crowds or injured people, entrapment, or normal conditions. If the individual was not on an office floor when the building was struck, that was recorded in an additional check-off column. This allowed the recording of multiple conditions for each individual.

Similar check-off columns were used to record observations of conditions in stairwells during evacuation: normal, door locked or jammed, crowded and/or hot, no power, water, cracked wall, debris, smoky or smell of fumes.

If and where the evacuees heard the announcement stating that WTC 2 was secure were also noted, as was their actions after hearing the announcment (i.e., continued evacuating, continued but saw others return to offices, or returned to or remained in office). The survivors’ location at time of impact, collapse of the towers and meeting of firefighters were also coded, as well as who helped them during the evacuation. Those who provided help were categorized as firefighters, Port Authority employees, external officials such as NYPD, FBI, and coworkers. Individuals’ disabilities were coded as ‘visually impaired,’ ‘hearing impaired,’ ‘physically challenged’ (e.g., obese, pregnant, or with asthma or heart conditions), ‘wheelchair users’ or ‘injured.’ People who mentioned that they had aided a disabled or injured person during the evacuation were also noted in this variable category, as were those who reported seeing injured or disabled people during their evacuation.

Presence during the 1993 World Trade Center bombing and whether they originally stayed inside the building at first on September 11, 2001 were recorded. Where the evacuee placed a phone call and the recipient of it were coded, along with whether or not they rested and where they rested. A series of check-off columns recorded if a person experienced obstructions, such as door jams, debris, smoke, no power, smell of fuel, water, fire, crowds, injured and disabled people or became trapped during the evacuation. Multiple entries were possible for each individual.

Other variables included the survivors’ knowledge of the situation, recorded as ‘high’ for those who knew a plane had struck the towers or that there had been a terrorist attack; ‘moderate’ for those who thought there was a fire, bombing or judged the situation as a serious emergency; and ‘low’ for those who were not aware of the reasons behind the evacuation. The evacuees’ indication of the level of seriousness was recorded as ‘very serious,' ‘somewhat serious’ and ‘not serious’ based on the perceived tone of the account. The variable ‘perception of others’ included the categories of ‘calm,’ in that evacuees felt others to be orderly and composed; ‘upset,’ which represented those who judged others as nervous, anxious or visibly bothered. For survivors who described others as hysterical or pushing and shoving, this field recorded their perception of others as ‘momentarily panicked.’ When accounts reported that those around them lent assistance to others, this field was coded as ‘helpful.’

Social influence on decision making was categorized according to who influenced the evacuee: authority figures, such as bosses or managers; groups of coworkers; or both authority figures and groups of coworkers. If a person indicated that he or she took on a leadership role, that was also captured. Using

new communication technology involved utilizing text messaging over pagers or wireless e-mail devices, TV or radio to gain information, (See Appendix A for further variable category definitions.)

The time that people reached the outside was recorded. It must be stressed that most accounts did not report specific times at which people took different actions. However, several occupants mentioned their location at key moments such as where they were when WTC 2 was hit or when WTC 1 or 2 collapsed. For example, one survivor of WTC 1 reports, "When we got to the twentieth (floor) I remember hearing a rumble. One of the fellows looked at me and we knew it didn't sound good. It must have been WTC 2 coming down" (Fink & Mathias, 2002). Thus, it was deduced that this survivor was on the 20th floor of WTC 1 at 9:59, when WTC 2 collapsed. Similarly, for many people, the time they reached the outside could be estimated from their description of events (e.g., WTC 2 being struck, WTC 2 collapsing) as they reached the outside.

4.3 Procedure

Various media avenues were utilized in gathering first-person accounts including television, radio, newspapers, magazines, websites, books and special media programs. Personal websites and e-mails written by survivors themselves were also used and are seen as the most valuable accounts, as they have not been altered by media editors in any way, but appear in their full, original format. During the three months following the events, over 280 first-person accounts were collected. Eventually, a total of 745 accounts were gathered from 465 individuals, as numerous survivors gave multiple stories to different journalists.

The accounts, which were gathered over a period of 18 months, were published up to 14 months after September 11, 2001. The distribution of published accounts over time is shown in Figure 1. Among the dated accounts studied, 51% were published in the first two weeks after September 11, 2001, with another influx of accounts surfacing around the one-year anniversary, 10-12 months after the disaster

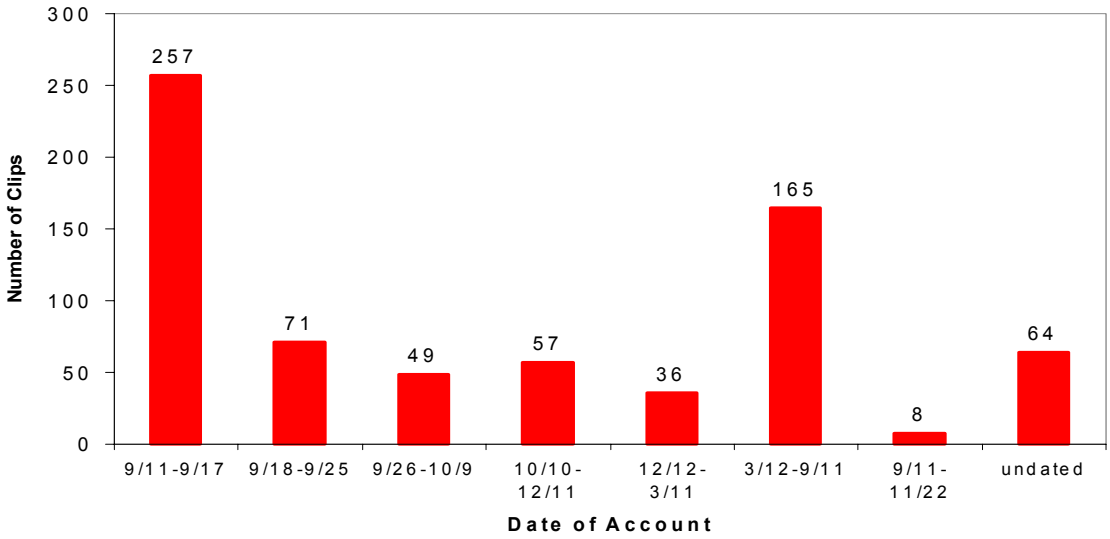

Figure 1. Distribution of Publication Dates of Accounts, N=707.

Content analysis was performed on the 745 accounts using 33 questions for which the data was entered into a qualitative spreadsheet. Duplicate accounts were merged, resulting in a final sample size of 435 individuals who were present either in WTC 1 or WTC 2. The data was then coded and transfer into a matrix for analysis.

5.0 STUDY RESULTS

The raw data for each account was entered into an Excel spreadsheet and then coded. The coded data was transferred into SPSS 11.0 for statistical analysis. The statistical analysis conducted was essentially descriptive statistics to organize and summarize the information. Inferential statistical tests were not conducted since the data obtained is not a representative sample of the population and results should not be generalized. A few Cramer's V tests were performed to better describe the degree of association between some variables. A Phi or Cramer's V can range from 0 (for no association) to 1.00 (for perfect association) with a value of .260 or higher which is considered evidence of a significant relationship between variables (Hays, 1994). Although the results are reported using terms such as 'the occupants' and 'the survivors,' the results refer only to the accounts analyzed. These results should not be generalized to all occupants of the two towers on September 11, 2001.

5.1 Profile: Gender and Age

The sample contained accounts from 435 survivors, ranging in age from 20 to 89 years old (mean = 39.5, SD = 11.8). The total sample contained accounts from 118 women (27%) and 314 men (72%); 3 accounts did not mention their gender (1%). It is speculated that the substantially higher number of men in the sample occurred because there were more men working in the two towers than women or that men may be more likely to talk to the media than women. The breakdown by gender and age is shown in Figure 2.

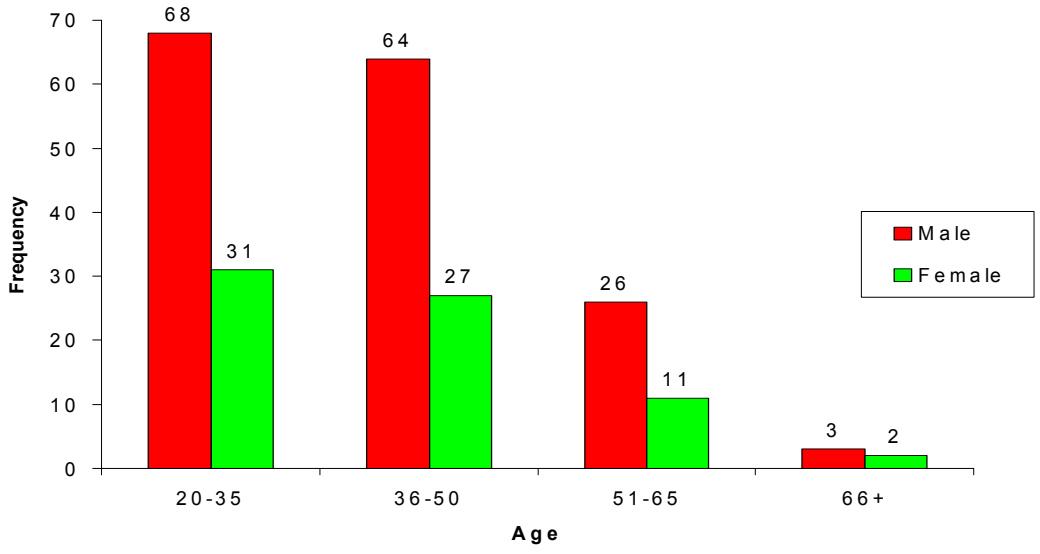

Figure 2. Gender and Age Distribution.

5.2 Location at the Beginning of the Event

There were 251 individuals who were located in WTC 1, comprising 58% of the sample, with 42% or 184 people from WTC 2. In WTC 1, 90 people (36%) were from upper floors (77-110), 79 people (31%) were from mid levels (43-76) and 58 people (23%) were from the lower floors of WTC 1. Another 22 people (9%) were in elevators and two people did not specify a location. In WTC 2, 94 people (51%) were from upper floors, 57 people (31%) were from mid floors, 28 people (15%) were from the lower levels of WTC 2 and five people did not specify a location. Although the distribution of accounts in the two buildings was not identical, a good number of reports were obtained from the three strata in both buildings.

5.3 Means of Egress Used

On September 11, 2001, almost all individuals from WTC 1 (198 people) reported using the stairs to evacuate while three used both stairs and elevator and one used the elevator only. In WTC 2, 114 (72% of the total for that building) used the stairs while 18 people (11%) used elevators and 26 (16%) used a combination of elevators and stairs. These results are shown in Table 3. Of the 44 people who used the elevator to evacuate WTC 2, 37 were from floors served by the 78th sky lobby and 7 were from floors between the 44th and 78th sky lobbies. From these accounts, it seems that the higher up people were in WTC 2, the more likely they were to use the elevator as a means of egress. A Cramer's V value .456 indicates a significant relationship exists between floor location and mode of egress within WTC 2.

Table 3. Means of Egress Used within the Towers.

	WTC 1, N=202	WTC 2, N=158
Stairs	198 people (98.0%)	114 people (72%)
Elevator	1 person (0.5%)	18 people (11%)
Stairs & Elevator	3 people (1.5%)	26 people (16%)

5.4 First Cue Reported

The first cues of the event that were mentioned in the accounts were found to differ depending on which tower the person were located. For WTC 1, the first building hit, the most common first cue of the event reported by 146 people (69% of people in that tower) was 'building movement,' such as feeling the building sway and tremble – many thought the building was going to tip over. WTC 2 occupants most commonly reported first becoming aware of the event from 'visual' cues (96 people) such as fire, debris and smoke, most likely coming from WTC 1. Several people reported more than one first cue, so they may appear more than once in Table 4 and percentages total more than 100%.

Interestingly, only 25 people made any mention of building alarms in their evacuation accounts. Of those, eight in WTC 1 and one in WTC 2 reported hearing alarms but did not specify where. Two in WTC 1 and one in WTC 2 heard alarms while on their floors and one person in each tower heard alarms while in the stairs. Eight people in WTC 1 stated that they did not hear alarms. Three people in WTC 2 said they never heard alarms, but two of them were outside the building when it was hit.

5.5 Time to Start Evacuation

After perceiving these first cues, 101 people from WTC 1 (47%) 'immediately' started evacuating, while 84 people (52%) 'immediately' started their evacuation of WTC 2. As can be seen in Figure 3, similar

Table 4. First Cues of Event within the Towers.

First Cues	WTC 1, N=212	WTC 2, N=145
Audio cues: heard explosion, crash, rumble	107 (50%)	69 (48%)
Visual cues: saw fire, incoming plane, debris, smoke	87 (41%)	96 (66%)
Building movement: felt building sway, tremble, jolt	146 (69%)	30 (21%)
Contents movement: furniture movement, ceiling falling	66 (31%)	11 (8%)
Warning from others	14 (7%)	34 (23%)
Impact	29 (14%)	1 (1%)
Smelled fumes or felt heat	12 (6%)	16 (11%)

numbers of people from both towers started evacuating 'shortly after' the first cue of the event (28 in WTC 1 vs. 27 in WTC 2). Another 46 people in WTC 1, and 40 people in WTC 2 'delayed' their evacuation. Some 23 people in WTC 1 (11%) reported they initially 'stayed,' while 10 people from WTC 2 (6%) also said they initially remained on their floors. Of the 16 people who reported being 'stuck' and therefore temporarily unable to start their evacuation, all but one were from WTC 1.

Among occupants who initially decided to stay, it is noteworthy to mention a group in WTC 1. Two survivors reported that a group of about 16 employees gathered in a conference room on Floor 64 of WTC 1. The group stayed in the room discussing the situation for approximately one hour before deciding to evacuate the building.

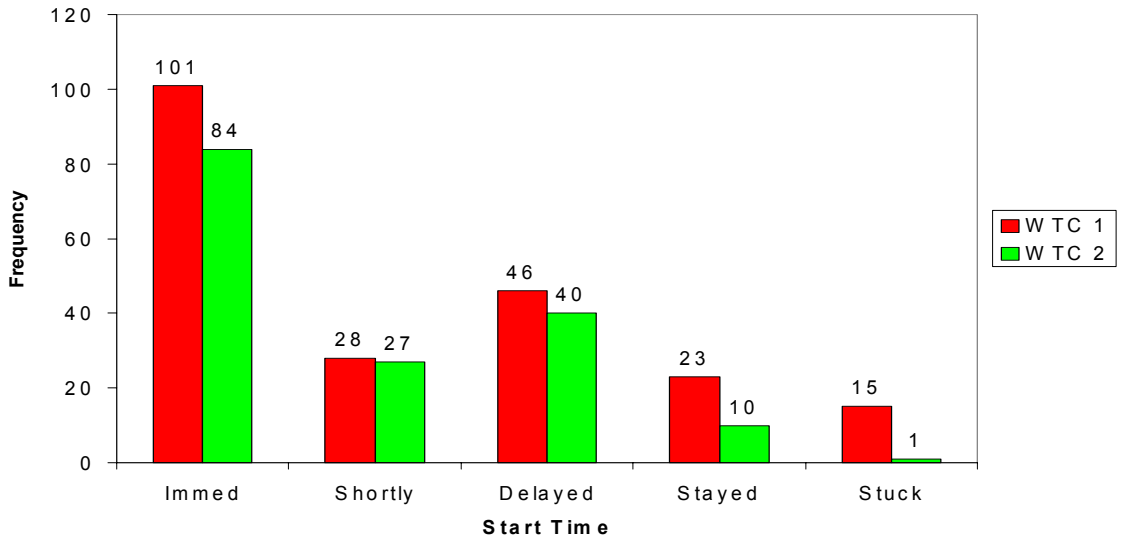

Figure 3. Distribution of Time to Start Evacuation.

Most of those who were not stuck but who took more than five minutes to begin evacuation delayed because they took the time to complete activities such as searching the floor, securing documents, making

calls, giving instructions, etc., or because they felt it was the right thing to do. Twenty-one of 63 people in WTC 1 (33%) and 13 of 45 people in WTC 2 (29%) delayed starting their evacuation because they were completing activities such as those described above. Of those in WTC 1 who did not begin their evacuation within five minutes, 12 people simply decided to stay (19%), compared to 20 people in WTC 2 (44%). In WTC 1, 17 of those who did not begin their evacuation within five minutes (27%) were helping others or required assistance themselves, compared to only four people (9%) in WTC 2.

5.6 Conditions on Floors and in Stairwells

It was possible to code multiple reported conditions on floors and in stairwells for each individual. Six people in WTC 1 and seven people in WTC 2 indicated that conditions on their floor were normal after their building was struck. For the 191 evacuees who commented on adverse conditions on their floors after the plane hit their tower, similar results emerged between the towers, in terms of the large proportions reporting smoke or debris and collapse damage on their floor. Specifically, the most frequently reported adverse conditions in WTC 1 were smoke (55% or 74 people), debris or collapse of wall, ceiling or floor (72 people or 54%), fire (41 people or 31%), darkness or loss of power (20 people or 15%) and smell of fuel (13 people or 10%). In WTC 2, the most frequently reported adverse conditions were debris or collapse of wall, ceiling or floor (38 people or 67%), smoke (25 people or 44%), darkness or loss of power (18 people or 32%), dust (10 people or 18%), smell of fuel (7 people or 12%) and injured people (7 people or 12%). The complete details are presented in Table 5.

Table 5. Adverse Conditions on Floor at Impact.

	WTC 1, N=134	WTC 2, N=57
Debris (collapse)	72 (54%)	38 (67%)
Smoke	74 (55%)	25 (44%)
Fire	41 (31%)	20 (35%)
No power, dark	20 (15%)	18 (32%)
Smell of fumes	13 (10%)	7 (12%)
Dust	9 (7%)	10 (18%)
Water	7 (5%)	3 (5%)
Door jammed	7 (5%)	2 (4%)
Crowds, people injured	2 (1%)	7 (12%)
Trapped	5 (4%)	2 (4%)

A large number of evacuees (106 people) mentioned that the stairwells were crowded and hot during their evacuation (71 people in WTC 1 and 35 in WTC 2). A total of 27 indicated that conditions in the stairs were otherwise normal. For the 155 evacuees who commented on adverse conditions in the stairwells during their evacuation (other than crowdedness), the majority in both towers reported smoke and the smell of fuel in the stairs (79 people or 72% in WTC 1 and 29 people or 63% in WTC 2). For other types of conditions in stairwells, responses between the two towers were quite different, as shown in Table 6.

5.7 Obstructions during Evacuation

More than one obstruction during evacuation could be recorded for each person. A total of 153 people in WTC 1 and 59 people in WTC 2 indicated encountering obstructions during their evacuation. Almost

Table 6. Adverse Conditions Reported in the Stairs during Evacuation.

	WTC 1, N=109	WTC 2, N=46
Smoke, smell of fuel	79 (72%)	29 (63%)
Water	49 (45%)	4 (9%)
Dark, no power	14 (13%)	9 (20%)
Debris (damage or belongings)	9 (8%)	14 (30%)
Cracked walls	5 (5%)	14 (30%)
Doors locked, jammed	12 (11%)	2 (4%)

half of the evacuees in each tower reported encountering crowds and injured people in the stairs, and indicated that they interfered to some degree in their evacuation (46% in each tower). The next most frequently reported obstructions were smoke and debris. The details are shown in Figure 4.

Of the 22 evacuees who reported encountering jammed or locked doors, 20 were in WTC 1 and all but three were located on upper floors. One of the WTC 2 evacuees reported that an elevator door was jammed by debris and the other reported a locked door on reaching the bottom of the stairs. Of the 25 evacuees who reported being trapped, nine were in elevators, eight were trapped by debris or smoke when their building was hit, five were trapped in the collapse of WTC 2, and three were trapped when WTC 1 collapsed.

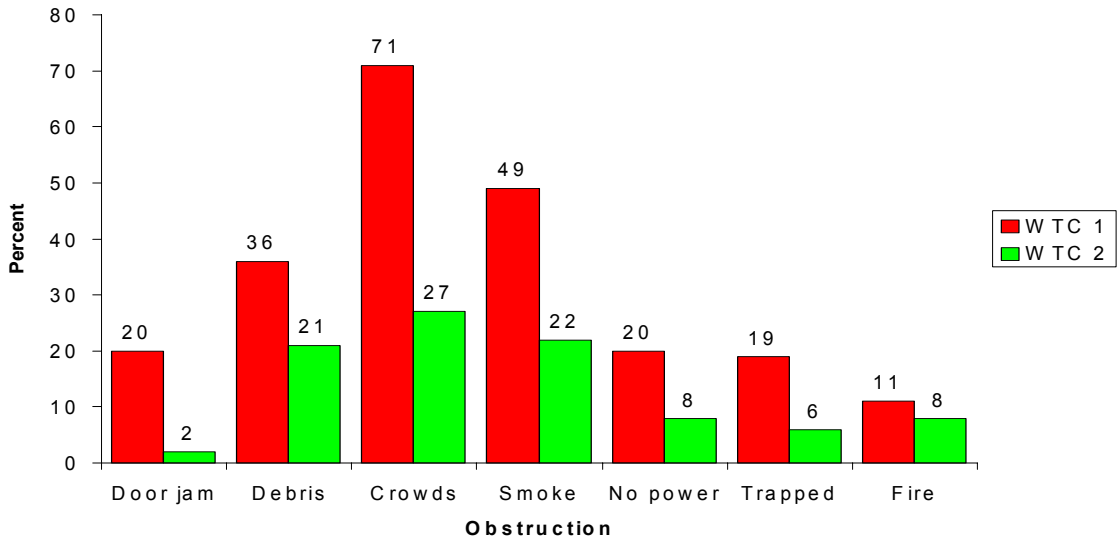

Figure 4. Obstructions Encountered During Evacuation in Both Towers.

5.8 Announcement

It is estimated that the WTC 2 announcement came over the public address system at approximately 9:00 a.m., as the majority of survivors said they heard it just minutes before WTC 2 was struck, which occurred at 9:03 a.m. As one survivor from the 103rd floor of WTC 2 describes, "When we reached the

70th floor we heard the announcement. The building was secure; no one needed to evacuate. We had descended down 3 more floors to the 67th when the second plane hit our tower" (csmonitor.com, 2001). Of the 184 WTC 2 occupants, 96 people (52%) mentioned hearing this announcement in their accounts. The majority of them, 69 survivors, decided to disregard the instructions of the message and continue their evacuation; however, 16 people (17%) said they remained in their offices or decided to return back up to their offices after hearing the message. Those returning did not have time to travel very far before the second plane hit; at that point they all resumed their evacuation down.

5.9 Location When WTC 2 Was Hit

Of the 273 survivors who mentioned their location at the time WTC 2 was hit, 36 people reported being somewhere inside the stairwells of WTC 1, while 14 people reported being on various floors of WTC 1. Fifty-six did not give a specific location and 15 had already reached the outside. Of the survivors from WTC 2, 65 people reported they were in the stairs and 52 occupants reported they were on various floors within WTC 2. Four did not give a specific location and 31 had already left the building. Of these people who were on the floors within WTC 2, 19 were on the upper floors (77th and above) at impact and survived. One of these occupants who survived the plane impact on the 78th floor of WTC 2 describes the stairwell: "a tornado of hot air and smoke and ceiling tiles and bits of drywall came flying up the stairwell. In front of me, the drywall split from the bottom up" (csmonitor.com, 2001).

5.10 Location When WTC 2 Collapsed

WTC 2 was the first of the towers to collapse at 9:59 a.m. Of the 296 survivors who mentioned their location at the time of WTC 2's collapse, 230 people (78%) were outside of the buildings, on the streets and surrounding areas. Some 47 people (16%) were still inside WTC 1 on lower levels from basement to the 42nd floor and three people (1%) were on mid levels (43-76) in WTC 1 when WTC 2 fell. Thirteen did not give exact locations and one was in an elevator. Three individuals were on the lower levels of WTC 2 (concourse) when it collapsed, and survived.

5.11 Location When WTC 1 Collapsed

WTC 1, the second tower to collapse, fell at 10:28 a.m. As approximately one hour and 40 minutes had passed since the initial WTC 1 impact, almost everyone who reported their location at the time WTC 1 collapsed was outside (263 people or 98%). Four people were on the lower levels of WTC 1 and two were in the concourse when it collapsed, and survived.

5.12 Location When They Saw Firefighters

For the evacuees who mentioned seeing firefighters during their evacuation, the location where they met them was recorded to gain an understanding of the dispersion of emergency workers throughout the towers. For the 169 people who reported meeting firefighters, 143 (add%) people saw them in WTC 1 with only 26 people (%) in WTC 2 mentioning their presence. In terms of floor location within WTC 1, it was found that a majority of the people (76 cases or 53%) saw firefighters in WTC 1 on the lower levels (basement-43rd) — 74 (%) saw firefighters in the stairwells and two (%) on a floor. Another 21 people (15%) saw firefighters on the mid floors (43rd-76th), 17 of them (%) were in the stairs while the other four people (%) were on floors. Also three people (%) saw firefighters on the upper floors (77th-110th) in office areas. All three were trapped on the 83rd floor. One survivor stated: "We saw two flashlights belonging to two New York City firemen. They told us to leave all of our possessions and to quickly follow them" (Manning, 2001). At the mezzanine, lobby or concourse level, 11 people (%) reported

seeing firefighters. The remaining 31 occupants (%) who saw firefighters inside WTC 1 did not give a location.

Among the 26 people (%)who mentioned seeing firefighters in WTC 2, eight saw them on the lower floors (basement-42nd), two saw firefighters in the mid floors of the building (43rd-76th). Some seven people (%) saw firefighters at the mezzanine, lobby or concourse levels while six people (%) in WTC 2 mentioned seeing firefighters but did not indicate their locations. Another three people indicated that they met firefighters outside WTC 2.

5.13 Time of Exit

For evacuees from both towers who indicated at what time they exited, it was found that as more time passed, a progressively greater number of people exited the building, as shown in Table 7. Of the 183 WTC 2 occupants who indicated what time it was when they left the building, 77 exited between 9:31 and 9:58 a.m. – WTC 2 collapsed at 9:59 a.m. Of the 211 WTC 1 occupants who indicated the time they left their building, 70 exited between 9:59 and 10:27 a.m. – WTC 1 fell at 10:28 a.m.

The six people who exited the towers after 10:28 a.m. were rescued from the rubble by firefighters up to several hours after the collapse.

Table 7. Time out of Towers.

	WTC 1 **(impact - 8:46 a.m.)** **(collapse - 10:28 a.m.)** **N= 211**	**WTC 2** **(impact - 9:03 a.m.)** **(collapse - 9:59 a.m.)** **N= 183**
8:48 – 9:02 a.m. (before WTC 2 impact)	19 Add %	37
9:03 – 9:30 a.m.	45	68
9:31 – 9:58 a.m. (before WTC 2 collapse)	72	77
9:59 – 10:27 a.m. (after WTC 2 collapse)	70	0
10:28 a.m. (after WTC 1 collapse)	5	1

5.14 Help Received and Help Given

Among the 435 accounts, 203 survivors described receiving help from others during their evacuation, with some mentioning more than one source of help. Some 84 people (37%) were helped by Port Authority personnel. Firefighters provided direct help to 65 people (29%). Another 65 people (29%) were helped by external officers such as NYPD or other rescuers. Help from coworkers was received by 34 people (15%).

Overall, 166 people mentioned being comforted and reassured by passing firefighters. Several occupants of the two towers helped others during the evacuation. Among the first-person accounts, 20 people said they helped people with disabilities and 14 said they helped people who were injured during the event.

5.15 Occupants with Disabilities or Injuries

Among the 27 persons reporting a disability in their account, two were visually impaired, three were hearing impaired, three used wheelchairs and 19 others were physically challenged such as suffering from a heart condition, asthma, obesity, etc. Some 22 people mentioned seeing people with disabilities.

Another 47 people (%)who provided first-person accounts were injured that morning. Some accounts from people who suffered injuries reported exiting the buildings later in the evacuation process. However, in numerous accounts occupants mention moving aside in the stairwells to let badly injured and burned people pass, thus it is assumed that those with extreme injuries who were mobile exited the building faster than the majority of others. For instance, one survivor from the 88th floor of WTC 1 who suffered burns to over 77 percent of her body reported that crowds parted in the stairwell to let her through (Kugler, 2002). These victims were all accompanied by coworkers or emergency workers. Some 25 people mentioned seeing injured people coming down in the stairwells.

Of those people, 23 (%)with disabilities and 43 (%)with injuries mentioned a time to start. Out of these 66 people, 50% (13 people with disabilities and 20 injured) started evacuating ‘immediately,' 5% (2 disabled and 1 injured) left ‘shortly after,' 29% (7 disabled and 12 injured) ‘delayed’ evacuating, 14% (1 wheelchair user and 8 injured) initially decided to ‘stay’ and 3% (2 injured people) were initially ‘stuck.'

5.16 Phone Calls

An overwhelming 87% of those who placed phone calls (151 people % of the accounts) were trying to contact their families and friends to let them know their whereabouts and gather information from them. Only 12 people (7%) tried contacting authorities, such as building security or calling 911, and 20 people (12%) placed calls to their boss or colleagues. Eleven people (6%) did not say who they called.

The majority of people who placed phone calls that morning did so once they were outside (93 people or 54%); however, many did not get through as most calls were dropped due to system overloads. Forty-four people (25%) mentioned that they placed calls from their offices before evacuating, 13 people (8%) called from other floors and 10 people (6%) attempted to make phone calls while in the stairwells.

5.17 Knowledge of Situation

In judging the evacuees' knowledge of the situation, categories were created. A ‘high level’ of knowledge indicated knowing that planes had hit the towers or that there had been an explosion within the towers. Those who speculated about a bombing, saw fire and debris or had reason to believe an emergency was occurring were said to have ‘moderate levels’ of knowledge. Survivors who were not aware of the reasons behind the evacuation were classified as having ‘low levels’ of knowledge. Level of knowledge was coded for 330 people. As shown in Figure 5, survivors with ‘high levels’ of knowledge accounted for 69 people; 214 people were judged to have ‘moderate levels’ of knowledge and 47 survivors had ‘low levels’ of knowledge regarding the events of that morning.

5.18 Knowledge and Time to Start

Out of the 66 survivors with ‘high levels’ of knowledge and a reported start time, 36 people (55%) started their evacuation ‘immediately’ or ‘shortly after,' while 18 people (27%) ‘delayed’ and 12 people (18%) initially ‘stayed’ or were ‘stuck.' Among the 203 people with ‘moderate levels’ of knowledge and a reported start time, a greater percentage of them left ‘immediately’ or ‘shortly after’ (138 people or 68%). Out of the 44 evacuees with ‘low levels’ of knowledge, 29 people also left ‘immediately’ or ‘shortly after’ (66%). Nine people with ‘low levels’ of knowledge also reported being ‘stuck,' which could explain their

lack of knowledge regarding the situation. People with high levels of knowledge may have had reasons to be slow, such as obstructions or taking time to help others.

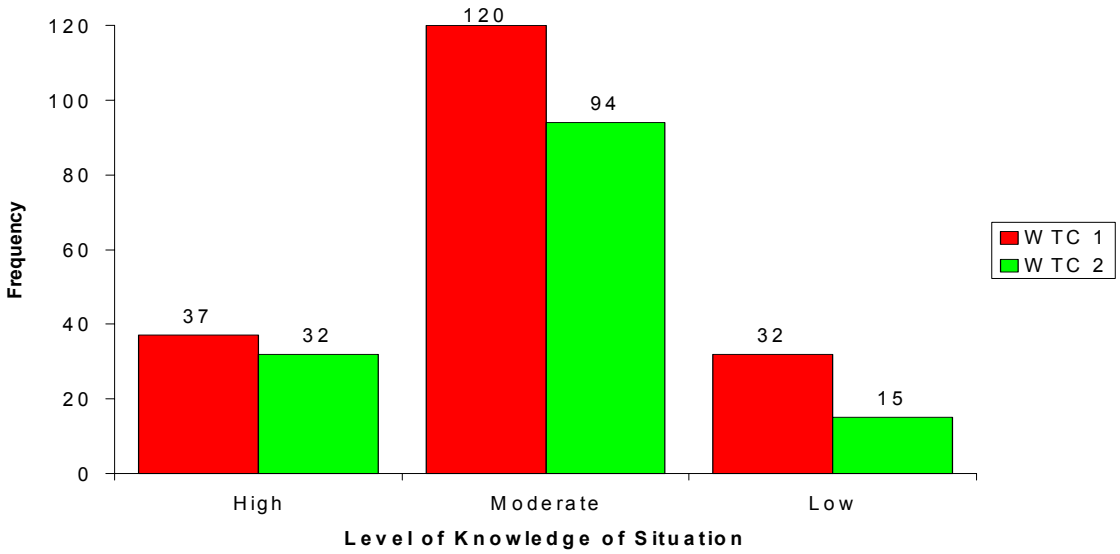

Figure 5. Knowledge of Situation in the Towers.

5.19 Seriousness of Situation

Evacuees' apparent assessment of the seriousness of the situation was ranked under three categories, which included 'not serious,' 'somewhat serious,' and 'very serious.' A total of 299 survivors, some 82% of the 365 for whom assessment of seriousness could be judged, assessed the situation as 'very serious.' Another 40 people (11%) assessed the situation as 'somewhat serious,' and 26 people (7%) seemed to judge the situation as 'not serious.' Of those who seemed to assess the situation as 'not serious,' six people (30%) were also determined to have low levels of knowledge.

5.20 Influence of Others

Whether others influenced evacuees' decisions was also taken into consideration for 192 survivors. It appeared that 28 people were influenced by authority figures, such as their boss or manager, and complied with their instructions. Another 97 survivors seemed to be influenced by groups of people and coworkers. One person appeared to have been influenced by both authority figure(s) and the group. Many individuals indicated that they took on leadership roles that morning. Some 66 people reported they directed people to the stairs, searched for others, gave orders or somehow took part in organizing the evacuation.

Males were more likely to perceive themselves as taking on leadership roles that morning than females' (see Table 8). Some 38 women (59% of the females for whom influence could be inferred) were influenced by groups of coworkers, whereas only 58 men (46%) were apparently influenced by the group. Concerning leadership roles, 52 men (41%) reported adopting this behavior, compared to the 14 women who mentioned taking a leadership role (22% of the women). The difference between men and women taking on leadership roles was found to be statistically significant ($z = 2.61$, significant at 0.01).

5.21 Perception of Others

How survivors perceived others during the evacuation was recorded for 268 people -- others could have been perceived as 'calm,' momentarily panicked,' 'upset,' or 'helpful.' Multiple responses could be coded for each person. The results show that the majority (154 people or 57%) described people around them as calm and orderly. Some 84 people (31%) judged others as 'upset,' which included crying, shouting, nervous or anxious, but rational. There were 78 people (29%) who described others as 'momentarily panicked,' in that they were pushing, shoving or generally displaying behavior associated with chaos, while 59 people (22%) found others to be 'helpful.' More details are presented in Figure 6.

Table 8. Gender and Influence of Others.

	Males, N=127	**Females, N=64**
Authority Figures (boss, manager)	17 (13%)	11 (17%)
Groups/Coworkers	58 (46%)	38 (59%)
Both Authority and Groups	0 (0%)	1 (2%)
Took a leadership role	52 (41%)	14 (22%)

It was found that of 155 people in WTC 1, 93 survivors (%) judged others to be 'calm,' compared to 61 (%) of 113 people in WTC 2. Only 33 people in WTC 1 described others as 'momentarily panicked,' compared to 45 people in WTC 2. For the people in WTC 2, the perception of 'panic' occurred before WTC 2 was hit for at least three occupants, while another 29 survivors described others around them as 'panicky' after WTC 2 was hit. For two others, the 'panicky' behavior was reported at the point in time when each tower collapsed. It was not clear from the other 11 accounts from WTC 2 when the people around them were 'panicky.'

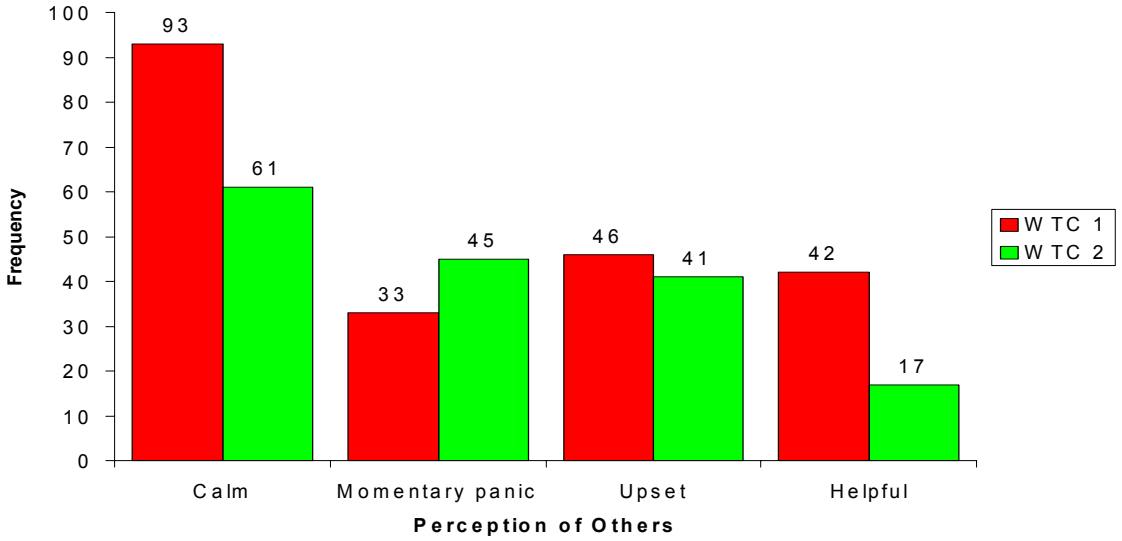

Figure 6. Distribution of Perception of Others between the Towers.

This variance in perception of others between the towers is illustrated by contrasting the following two accounts. One survivor from the 65th floor of WTC 1 said that those in the stairwells "maintained their calm really well" and went on to say that "A couple of people started crying a little, but we said, 'We're going to get out of here, we just have to take it one step at a time.' It wasn't quiet, people were talking – in fact someone was laughing, it was pretty normal" (Anderson, 2001). It is proposed that the occupants of WTC 2 observed others 'momentarily panicking' mainly once their tower had been hit. One survivor from the 70th floor of WTC 2 said "she and her fellow coworkers walked down to the 59th floor and took an elevator to the 44th floor, when at that point, another plane hit their tower and then there was a mad scramble down the stairs with people pushing, shoving and yelling" (Black, 2001).

Perception of others and gender are compared in Figure 7. Although more males than females found people to be panicked or upset (57% vs. 48%) and some 30% of females found others to be helpful compared to only 19% of men, the differences were not statistically significant.

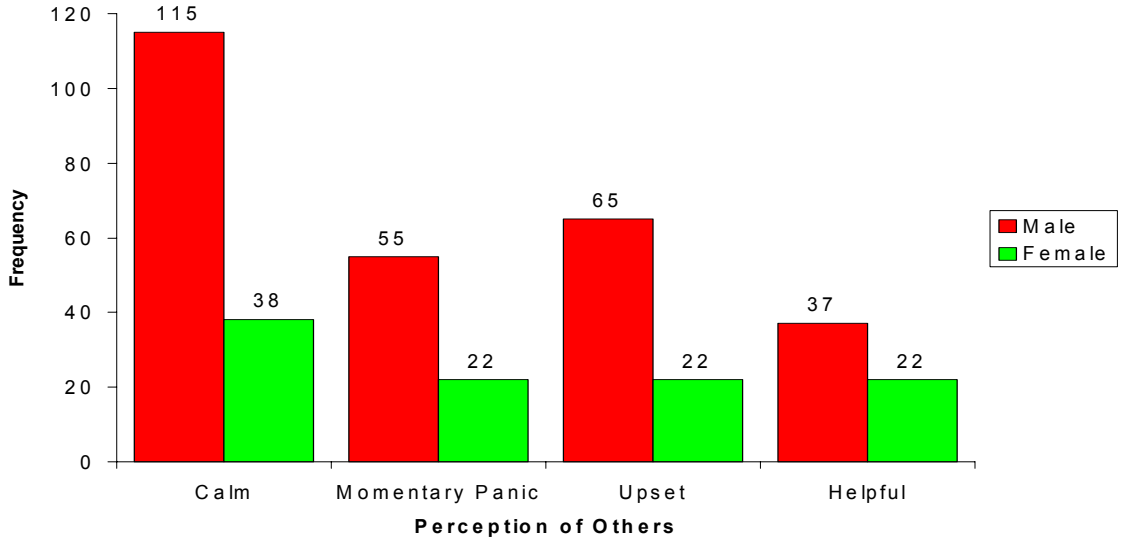

Figure 7: Distribution of Gender and Perception of Others

The distribution of perception of others by age group is shown in Table 9. Although the differences in reporting between the different age groups was not statistically significant, it is interesting to note that some of the most dramatic language ('chaos,' 'total chaos,' 'mayhem') was used by the youngest males.

Table 9. Distribution of Age and Perception of Others.

	21-35 yrs old (N=74)	36-50 yrs old (N=58)	51-65 yrs old (N=21)
Calm	39 (53%)	31 (53%)	9 (43%)
Panicked	25 (34%)	14 (24%)	6 (29%)
Upset	31 (42%)	22 (38%)	4 (19%)
Helpful	16 (22%)	17 (29%)	8 (38%)

5.22 Technology to Gain Information

In addition to the people mentioned earlier who made cell phone calls from the stairwells, 10 people used technology such as wireless e-mail devices and text pagers as a means of gathering information about the situation. Thirteen listened to the radio or watched television, among them three evacuees who stopped to watch TV on the mid floors (43-76) of WTC 1 and saw live media coverage of the events.

5.23 Impact of the 1993 Evacuation

Only 9% of the sample, some 41 people, were present during the 1993 bombing and evacuation of the World Trade Center. Of them, three people explained that their experience in 1993 helped them decide to start their evacuation immediately on September 11, 2001. Five people who were present in 1993 mentioned being better prepared this time with evacuation kits. These emergency escape kits were described as being equipped with flashlights, masks, glow sticks, whistles and water (Murphy & Levy, 2001). Another 18 people specifically mentioned that 1993 was on their mind during their evacuation, although they were not present during the events of 1993.

Four survivors reported seeing photoluminescent stripes on the stairs, railings and stairwell doors – an improvement the Port Authority made following the 1993 bombing. As one survivor stated, "All you had to do was follow those yellow-green stripes. They were wonderful. The stripes were especially valuable when the emergency stairs stopped and people had to travel horizontally through mechanical equipment spaces that had many doors" (Masetti, 2001).

A paraplegic survivor from WTC 1 who was also present for the 1993 evacuation of the World Trade Center commented on the successful use of an evacuation chair on September 11, 2001. The evacuation chairs were part of the improvements made to the World Trade Center evacuation process after the 1993 bombing, and this survivor credits the chair with saving his life. In 1993, he was bounced down the stairs in his electric wheelchair from the 69th floor to the 43rd floor, where he was then transferred to a stretcher and carried down the rest of the way. It took him 6 hours to evacuate from the 69th floor in 1993. On September 11, 2001 using the evacuation chair enabled him to escape the 69th floor of WTC 1 and get to street level in 1 hour 30 minutes. He went on to say, "If it weren't for the evacuation chair and the 10 people that brought me down, I would not have made it, that's for sure. That evacuation chair made the difference." (Fink & Mathias, 2002).

6.0 SUMMARY RESULTS

Although it is recognized that content analysis of first-person accounts has limitations, and the results cannot be generalized to all occupants of the towers, this methodology was found to be particularly useful in this case. With the large number of accounts that were gathered from all sorts of sources, the similar themes and experiences within these texts became more than merely anecdotal stories. Using first-person accounts proved to be the only timely method available to gather information on human behavior of the survivors from the World Trade Center towers. Considering that a great majority of the accounts became public within three weeks following the events and that recollection of human behavior is delicately time sensitive, it was important to analyze this information. This methodology could prove useful in future projects dealing with first-person accounts, although events of the magnitude of September 11, 2001, which produced such a large number of first-person accounts, are extremely rare.

For the accounts gathered from media sources, it is recognized that they may represent the most dramatic stories of the evacuation, as the motivating factor behind mass media is to publish eye-catching, emotion-

laden headlines. At the same time, those survivors who have dramatic stories of escape may be more inclined to share them compared to other survivors who may judge their evacuation as less eventful. However, the accounts analyzed were from survivors located in several areas in each tower representing a very good distribution of floors from the upper, middle and lower strata of the two towers. In total, 745 accounts were analyzed, representing 435 survivors from WTC 1 and WTC 2.

An interesting and important observation involves the emergence of new first-person accounts from survivors who had not previously shared their stories, around the first anniversary of the event. In trying to explain this phenomenon, it is speculated that survivors who had not previously shared their stories were now prepared to do so after having time to cope and deal with their experience. Many of the evacuees mentioned that telling their stories proved to be a therapeutic exercise. Media sources may have also held accounts gathered from an earlier date or searched for new, untold stories and published them as part of the anniversary coverage.

An important observation stemming from the accounts analysis encompasses the issue of evacuation strategies. It was found that 44 people, some 24% of WTC 2 occupants in this sample, used the elevators at some point during their evacuation, although it has long been accepted among fire safety experts that people know they should not use elevators as a means of egress during an emergency. Thus, the behavior of these WTC 2 evacuees challenges this assumption and demonstrates that occupants of high-rise structures are prepared and willing to use elevators to evacuate during an emergency situation. It is speculated that these occupants debated between learned instruction - not to use elevators for evacuation, and time or practicality - which route provided the fastest exit possible. Those who chose to use the elevators may have thought it was the quickest or safest route of escape and may have believed they were not in immediate danger, therefore were justified in their decision to use the elevators to evacuate.

This same theme is echoed when examining the reactions of the 96 WTC 2 occupants who heard the public address announcement, which told them their building was secure and to return to their offices. Only 16 people took heed of this message and stopped their evacuation, making their way back to, or remaining in, their offices. Through all accounts studied (with the exception of maybe one) there was no doubt that people understood the message, as there were no audibility or intelligibility issues; the content of the message was clear. However, the overwhelming majority of 69 occupants made their decision based on the information that they had at that point in time and decided to disregard the order and continue evacuating – a decision that would save their lives. As one survivor stated, “I was thinking that there is a real difference of opinion here about what my eyes are seeing and what the announcement was saying” (Murphy & Levy, 2001). This decision to carry on with the evacuation may also reflect the concept of commitment: as these occupants had already made the decision to leave, they pursued this task.

It is also interesting to note that the official procedure for emergencies in the World Trade Center was to meet in the lobby area on each floor and wait for instruction. Nevertheless, the majority of occupants of both towers decided to evacuate on their own after WTC 1 was hit, without waiting for instruction. Thus, this is further evidence that people will make decisions based on what they judge the proper action to take despite official procedures.

Those who had experienced the 1993 terrorist bombing of the World Trade Center were prompt at leaving. Although their past experience could have suggested that the evacuation was going to be long and difficult and that people who stayed behind would be evacuated by rescuers later on, very few used this as rationale. Instead, most occupants with experience from 1993 felt an urgency to leave immediately.

The results show that 18 people who were identified as having 'high levels' of knowledge delayed evacuating. It is assumed these survivors were not in the immediate vicinity of danger, but knew an airplane had hit the building or suspected it was a terrorist attack. Those who delayed their evacuation reported that they rushed to gather their belongings or went to backup important company files, for they suspected they would not be returning to the building for an extended period of time. These are rational actions, therefore it is concluded that those with 'high levels' of knowledge who delayed evacuating had to have been in areas where the threat to personal safety was not high.

The overall impression of the emotional atmosphere during the evacuation, after reading all 745 accounts, was that of calm and order. Although some reported crying and being anxious or nervous, the majority viewed themselves and others as composed. A stark contrast in perceived behavior was found to exist between the two towers, with the majority of WTC 1 occupants reporting others as calm (60% or 93 people), where as a large proportion of WTC 2 occupants perceived others to be 'panicked' (40% or 45 people). This perception of 'panic' occurred before WTC 2 was hit for at least three occupants, while another 29 survivors perceived others as 'panicked' after WTC 2 was hit. After their building had been struck, WTC 2 occupants may have realized they were under attack, which could possibly explain the heightened level of anxiety in the tower. (It is important to note, however, that the colloquial use of the word panic more often describes a state of mind -- high anxiety, for example -- rather than the irrational actions that more correctly define 'panic.')

Many evacuees who mentioned seeing firefighters felt reassured and safe due to their presence. Although the emergency crews disrupted evacuation in the stairwells by going against traffic, the occupants appreciatively cheered them on. It is assumed that this counter flow did not prevent occupants from evacuating as the last people to exit reported being alone in the stairs while they were descending rapidly seconds before the collapse.

Evacuees used technology such as cell phones, wireless e-mail devices and text messaging over pagers during their descent as a means of gathering information about the situation unfolding around them. This phenomenon raises important issues regarding the information age and how new technologies can be taken advantage of to aid in emergency situations. If technology can help to disseminate timely information to the public in times of crises, strategies should be developed in order for authorities to be able to fully utilize such technology.

7.0 FUTURE WORK

Future research is needed to fully understand the evacuation behavior of the occupants who were in the two towers of the World Trade Center on September 11, 2001. A variety of approaches should be used to gather this information such as interviews and questionnaires. Unfortunately the extended amount of time that has elapsed since the events is an important factor to mitigate since occupants' recollection may be incomplete and contaminated by what has been seen, read or heard since September 11, 2001.

This major event, which was repeatedly broadcast on television around the world, may also influence fire safety in high-rise buildings in general. It is essential to study how the perception of risk in high-rise buildings has changed since September 11, 2001. Do people who live, work or visit high-rise structures feel more at risk of a potential fire or fear that the building might collapse if there is a fire? If the occupants feel more at risk what is their likely behavior and response in future emergency? Studies should be conducted to explore the impact of high-rise risk perception on intended behavior in future emergencies. Are occupants prepared to follow procedures and instructions? Would they comply with a

protect-in-place approach or to move to a refuge floor? If all occupants want to evacuate to ground during an emergency requirements for stair design and building height might need to be revisited. Drill studies should be conducted to observe unannounced emergency evacuations in high-rise buildings, varying evacuation strategy and information provided to occupants to assess actual response. Longitudinal studies should also be conducted to assess the impact of September 11 over time on high-rise building occupants.

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Appendix A
WORLD TRADE CENTER FIRST-PERSON ACCOUNTS CODE BOOK

THIS CODE BOOK CONTAINS SPSS VARIABLE NAMES, VARIABLE LABELS, VALUE CODES, VALUE LABELS AND CATEGORY DEFINITIONS. CODE 99 OR N/A STANDS FOR 'NOT APPLICABLE' OR 'NO INFORMATION'.

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1. BLDG - 'Building Location at the Time of Awareness / Perception of First Cue'
    1 = Tower 1, North Tower
    2 = Tower 2, South Tower
    3 = Plaza/Outside
    4 = Concourse
    5 = Mall
    6 = PATH Train
    7 = Bldg 7 or Bldg 3
    99 = n/a

2. FLR - 'Floor Location at Perception of First Cue'
SPLIT COLOMN EXACT FLOOR AND CATEGORY
    1 = T1 Lower (basement-42) in stairs
    2 = T1 Lower (basement-42) on a floor
    3 = T1 Mid (43-76) in stairs
    4 = T1 Mid (43-76) on a floor
    5 = T1 Upper (77-110) in stairs
    6 = T1 Upper (77-110) on a floor
    7 = T1 in stairs, level not specified
    8 = T1 location not specified
    9 = T1 mezzanine, lobby, concourse
    10 = T2 Lower (basement-42) in stairs
    11 = T2 Lower (basement-42) on a floor
    12 = T2 Mid (43-76) in stairs
    13 = T2 Mid (43-76) on a floor
    14 = T2 Upper (77-110) in stairs
    15 = T2 Upper (77-110) on a floor
    16 = T2 in stairs, level not specified
    17 = T2 location not specified
    18 = T2 mezzanine, lobby, concourse
    19 = Outside
    22 - T1 elevator - lower floors
    23 - T1 elevator - mid floors
    24 - T1 elevator - upper floors
    25 - T1 elevator, level not specified
    99 = n/a

3. SEX - ‘Sex of Evacuee’

1 = male
2 = female
99 = n/a

4. AGE_CODE - ‘Age of Evacuee’
SPLIT COLOMN EXACT AGE AND CATEGORY

1 = 21-35
2 = 36-50
3 = 51-65
4 = 66 +
99 = n/a

5. DATE - ‘Date of Record’
SPLIT COLOMN EXACT DATE MENTIONED

1 = Week of (09/11/2001-09/15/2001)
2 = 2 weeks after (09/16/2001-09/30/2001)
3 = 1-3 months after (10/01/2001-12/31/2001)
4 = 4-6 months after (1/01/2002-3/31/2002)
5 = 7-9 months after (4/01/2002-6/30/2002)
6 = 10-12 months after (7/01/2002-9/30/2002)
99 = n/a

6. EGRESS - ‘Evacuation Method’

1 = Stairs
2 = Changed stairwells
3 = Elevator
4 = Combo of stairs and elevator
99 = n/a

7. FSTCUE - ‘First Cue of Event’
COLUMN CHECKED OFF FOR EACH INITIAL CUE MENTIONED

1 = Audio (boom, crash, explosion, thunder, blast, roar, rumbling)
2 = Visual (smoke, fire, bodies, plane approaching, panicked people, debris falling)
3 = Building Movement (impact, sway, shake, earthquake, rocking, jolt)
4 = Content Movement (chairs moving, ceiling falling, bounce in elevator, debris in halls/offices, lights flickering, change in air pressure, burned by fire)
5 = Warn by others (directly told or behavior of others)
6 = Physically impacted (burned, fell or thrown out of chair)
7 = Smelled fumes or Felt heat
99 = n/a

8. ALRM – Heard Alarm

1 = Yes, heard alarm
2 = Heard alarm on floor
3 = Heard alarm in stairs

4 = ‘I did not hear an alarm’
99 = n/a

9. STTIME - ‘Time to Start Evacuation’
1 = Immediately (ran, right away, rapidly): 1 minute
2 = Shortly after (short delay, picked up belongings, warn others): up to 5 minutes after
3 = Delayed (gathered belongings, look out window, make phone calls, watch TV, kept working, checked security, planned with coworkers, shut equip off, Post T2 Impact)
4 = Stayed (to help: headcount, direct people, assisted coworkers, waited to be rescued/given instructions; went up)
5 = Stuck (behind debris, walls, in elevator)
99 = n/a

10. CNDFL - ‘Condition on Floor When Building was Hit’
1 = Devastated (combo of debris, fire, walls collapsed, ceiling/lights down, darkness, water/sprinklers, smoke, jet fuel, glass, bodies)
2 = Abnormal (some smoke, heat, smell fuel, power out, dusty, debris past windows, some reason for alarm/evacuation)
3 = Normal (usual working conditions)
99 = n/a (incl. not on floor when building was hit)

11. CNDFL – ‘Condition on Floor’
COLUNM CHECKED OFF FOR EACH CONDITION MENTIONED.
1 = Normal
2 = Door Jammed
3 = Debris – Wall, ceileing collapsed
4 = Smoke
5 = Dust
6 = No power – dark
7 = Smell
8 = Water
9 = Fire
10 = Crowd, injuries
11 = Trapped
12 = Not on a floor
99 = n/a

12. STRS - ‘Condition in Stairwell During Evacuation’
COLUMN CHECKED OFF FOR EACH CONDITION MENTIONED.
1 = Normal
2 = Door locked, jammed
3 = Crowd, hot
4 = No power
5 = Water
6 = Cracked wall
7 = Debris

8 = Smoky, smelly
99 = n/a

13. ANCHRD - 'Heard Announcement'
    1 = T1 Yes
    2 = T1 No (mentioned specifically not hearing message)
    3 = T2 Yes
    4 = T2 No (mentioned specifically not hearing message)
    99 = n/a

14. ANCACT - 'Action After Hearing T2 Announcement'
    1 = Continued evacuating
    2 = Continued evacuating saw some returned
    3 = Returned to office/Stay on location
    99 = n/a

15. ANCFLR - 'Location when T2 Announcement Heard'
    10 = T2 Lower (basement-42) in stairs
    11 = T2 Lower (basement-42) on a floor
    12 = T2 Mid (43-76) in stairs
    13 = T2 Mid (43-76) on a floor
    14 = T2 Upper (77-110) in stairs
    15 = T2 Upper (77-110) on a floor
    16 = T2 in Stairs not specified
    17 = T2 Location not specified
    18 = T2 mezzanine, lobby, concourse
    19 = Outside
    20 = T2 in Elevator
    99 = n/a

16. LT2IMP - 'Location at T2 Impact'
    1 = T1 Lower (basement-42) in stairs
    2 = T1 Lower (basement-42) on a floor
    3 = T1 Mid (43-76) in stairs
    4 = T1 Mid (43-76) on a floor
    5 = T1 Upper (77-110) in stairs
    6 = T1 Upper (77-110) on a floor
    7 = T1 in stairs, level not specified
    8 = T1 location not specified (incl. Inside elevator)
    9 = T1 mezzanine, lobby, concourse
    10 = T2 Lower (basement-42) in stairs
    11 = T2 Lower (basement-42) on a floor
    12 = T2 Mid (43-76) in stairs
    13 = T2 Mid (43-76) on a floor
    14 = T2 Upper (77-110) in stairs
    15 = T2 Upper (77-110) on a floor

16 = T2 in stairs, level not specified
17 = T2 location not specified (incl. Inside elevator)
18 = T2 mezzanine, lobby, concourse
19 = Outside
99 = n/a

17. LT2COL - 'Location at T2 Collapse'
1 = T1 Lower (basement-42) in stairs
2 = T1 Lower (basement-42) on a floor
3 = T1 Mid (43-76) in stairs
4 = T1 Mid (43-76) on a floor
5 = T1 Upper (77-110) in stairs
6 = T1 Upper (77-110) on a floor
7 = T1 in Stairs not specified
8 = T1 in Elevator
9 = T1 mezzanine, lobby, concourse
10 = T2 mezzanine, lobby, concourse
11 = T2 Lower (basement-42) in stairs
12 = Outside
13 = Other WTC building
14 = Subway
99 = n/a

18. LT1COL - 'Location at T1 Collapse'
1 = Lower T1 (basement-43) stairs
2 = T1 mezzanine, lobby, concourse
3 = Outside
99 = n/a

19. LFFS - 'Location When Met Firefighters'
1 = T1 Lower (basement-42) in stairs
2 = T1 Lower (basement-42) on a floor
3 = T1 Mid (43-76) in stairs
4 = T1 Mid (43-76) on a floor
5 = T1 Upper (77-110) in stairs
6 = T1 Upper (77-110) on a floor
7 = T1 in stairs, level not specified
8 = T1 location not specified
9 = T1 mezzanine, lobby, concourse
10 = T2 Lower (basement-42) in stairs
11 = T2 Lower (basement-42) on a floor
12 = T2 Mid (43-76) in stairs
13 = T2 Mid (43-76) on a floor
14 = T2 Upper (77-110) in stairs
15 = T2 Upper (77-110) on a floor
16 = T2 in stairs, level not specified

17 = T2 location not specified
18 = T2 mezzanine, lobby, concourse
19 = Outside
99 = n/a

20. HELP - 'Who Helped Evacuee during Evacuation'
COLUMN CHECKED OFF FOR EACH HELPER MENTIONED
1 = Firefighter
2 = Port Authority (building staff/security)
3 = External Official (police, FBI, EMT, rescue workers)
4 = Coworkers
5 = Passed Firefighters in Stairs
99 = n/a

21. DSBLD - 'Evacuee Disability and Injury'
1 = Visual impairment
2 = Hearing impairment
3 = Physically challenged (obese, asthma, heart condition)
4 = Wheelchair user
5 = Injured during event (burned, sprained ankle, broken bones, emotional trauma)
6 = Helped disabled (during the evacuation)
7 = Saw disabled (during the evacuation)
8 = Helped injured
9 = Saw injured
99 = n/a

22. B1993 - '1993 WTC Bombing Presence'
1 = Yes
2 = Yes, prepared since (evacuation packs)
3 = Yes, reason evacuated early
4 = Yes, reason stayed
5 = No
6 = 1993 bombing in the back of their mind but were probably not there at the time
99 = n/a

23. DELAY - 'Reason for Delay in Evacuation'
1 = Decide to stay
2 = Activity to complete before leaving (search floor, secure document, made calls, instruct others)
3 = Went Up/Return
4 = Stuck or trapped
5 = Help others, disabled or injured/Being helped
6 = Told to stay
99 = n/a

24. LPHONE - 'Location when Evacuee Made Phone Call'

1 = Office
2 = Other floor
3 = Stairs
4 = Outside
5 = Multiple locations
99 = n/a

25. WPHONE - 'Recipient of Evacuee Phone Call'
COLUMN CHECKED OFF FOR EACH GROUP MENTIONED
1 = Family and friends (spouse, parents, home)
2 = Colleague or boss
3 = Authorities (building security, 9-1-1)
99 = n/a

26. REST - 'Rest during Evacuation'
1 = T1 Lower (basement-42) in stairs
2 = T1 Lower (basement-42) on a floor
3 = T1 Mid (43-76) in stairs
4 = T1 Mid (43-76) on a floor
5 = T1 Upper (77-110) in stairs
6 = T1 Upper (77-110) on a floor
7 = T1 in stairs, level not specified
8 = T1 location not specified
9 = T1 mezzanine, lobby, concourse
10 = T2 Lower (basement-42) in stairs
11 = T2 Lower (basement-42) on a floor
12 = T2 Mid (43-76) in stairs
13 = T2 Mid (43-76) on a floor
14 = T2 Upper (77-110) in stairs
15 = T2 Upper (77-110) on a floor
16 = T2 in stairs, level not specified
17 = T2 location not specified
18 = T2 mezzanine, lobby, concourse
19 = Outside
99 = n/a

27. OBSTCN - 'Obstructions Encountered During Evacuation'
COLUMN CHECKED OFF FOR EACH OBSTRUCTION MENTIONED
1 = Door Jam (locked or jammed)
2 = Debris (wall falling, floor collapse, material damaged)
3 = Smoke
4 = No power
5 = Smell (of fuel)
6 = Water
7 = Fire
8 = Crowd, disabled, injured
9 = Trapped by building rubble
99 = n/a

28. TMOUT - 'Time Evacuee Exited Building'
    1 = T1: 8:48-9:02
    2 = T1: 9:03-9:30
    3 = T1: 9:31-9:58
    4 = T1: 9:59-10:27
    5 = T1/T2: 10:28+
    6 = T2: 8:48-9:02
    7 = T2: 9:03-9:30
    8 = T2: 9:31-9:58
    99 = n/a

29. KNWSIT - 'Evacuee's Knowledge of the Situation in the Initial Moment'
    1 = High (terrorism/plane attack/ T2 collapsed/saw plane approaching/hitting building)
    2 = Moderate (fire/bomb/earth quake/serious emergency/speculated plane/rumors)
    3 = Low (reason for evacuation unknown or limited)
    99 = n/a

30. SRSNSS - 'Level of Seriousness to Themselves in the Initial Moment'
    1 = Very serious (fear, scared, want to get out ASAP)
    2 = Somewhat serious (worried, did not know what was happening)
    3 = Not serious (not concerned)
    99 = n/a

31. SOINFL - 'Social Influence on Evacuee's Decisions'
    1 = Authority figure (boss, supervisor, manager)
    2 = Coworkers/Group influence
    3 = Survivor took leadership role
    4 = Boss and group influence
    99 = n/a

32. TCINFL - 'Technological Influence on Knowledge during Evacuation'
    1 = Cell phone
    2 = Blackberry, Text pager (deaf)
    3 = TV, radio
    4 = Walkie Talkie
    99 = n/a

33. PERCEP - 'Perception of Others During Evacuation'
COLUMN CHECKED OFF FOR EACH PERCEPTION MENTIONED
    1 = Calm/Orderly (civil, supportive, chatty, composed)
    2 = Momentarily Panicked (running, pushing, shoving)
    3 = Upset (crying, shouting, fearful, anxious)
    4 = Helpful (assisting others)
    99 = n/a