



## Physical Anthropology Section – 2008

### H106 Fragmentation Patterns of Victims From a Fatal Aviation Accident

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After attending this presentation, attendees will gain an understanding of how fragmentation patterns of the victims can assist in the analysis and investigation of plane crashes and the events prior to the crash. This study will evaluate if there exists a fragmentation pattern of victims in high velocity impact plane crashes as well as a relationship between the assumed seat locations of the victims and the extent of their injuries.

This presentation will impact the forensic science community by demonstrating the ways in which the examination of the fragmentation patterns of human remains can add to the investigation of plane crashes as well as the recovery of human from the scene. In addition, it explores how this information can aid physical anthropologists during the triage of human remains from an aviation accident.

On November 12, 2001, American Airlines Flight 587, a regularly scheduled passenger plane bound for Santo Domingo, Dominican Republic, crashed in a residential area in Belle Harbor, New York, shortly after take-off from JFK International Airport. All 260 people aboard the flight, including the pilot, co-pilot, seven crewmembers and 251 passengers, were killed. In addition, five people on the ground were killed. This presentation assesses the injury and fragmentation patterns of Flight 587 victims in correlation with their seat location on the plane. Previous studies of injuries of plane crash passengers focused on determining whether the injuries were preventable and, if so, suggested safety features to reduce airline crash related casualties. In view of the Flight 587 passengers having no chance of survival, the objective of this study is to evaluate if there exists a fragmentation pattern of victims in high velocity impact plane crashes as well as a relationship between the assumed seat locations of the victims and the extent of their injuries. After attending this presentation, attendees will gain an understanding of how fragmentation patterns of the victims can assist in the analysis and investigation of plane crashes and the events prior to the crash.

In total, 2,058 body fragments were recovered. To date, 1,750 bodies and body fragments are identified and 308 remain unidentified. There were 112 nearly complete bodies recovered, including the five on the ground, 163 partial bodies, and 1784 fragments. Autopsies were conducted on 251 of the mostly whole and partial remains by Medical Examiners from the Office of Chief Medical Examiner, New York City. The autopsy reports of the victims include detailed information about the nature and extent of injuries. The descriptions of smaller fragments are less detailed but they include information regarding the body part, its size, and the extent of any burning. As in other disasters, the inclusion of physical anthropologists is pivotal in recognizing and accurately describing the fragments so as to obtain more detailed information to use in conjunction with Medical Examiner reports. Using these reports, the injuries of each victim are classified by location (head/neck, face, thorax, abdomen, extremities, and external) and their severity is scored following a revision of the Abbreviated Injury Scale system. The injury scores and the number of fragments that have been identified for each victim are examined in conjunction with the location of the victim's seat.

Preliminary results of Flight 587 show that 35 nearly complete bodies from victims seated in the front half of the plane were recovered compared to 70 from the back half of the plane, consistent with a nosedive crash. In addition, 75% of autopsied victims had avulsed brains and crushed skulls with lower limbs as the most frequently amputated body area suggesting considerable forward motion at high velocity; the last recorded airspeed of Flight 587 was approximately 288 miles per hour. Although witness reports suggest that the plane was banking to the left prior to crashing, 1,207 body remains of victims seated on left side of the plane were identified while only 433 remains from victims seated on the right side of the plane were identified. These results imply the remains of victims seated on the left suffered less postmortem damage facilitating both recovery and identification. Some witness reports also recalled a fire in the middle of the plane prior to crashing, however no autopsied victims, except those on the ground, had soot in the airways.

The fragmentation pattern from this flight, which crashed shortly after take-off and in a nosedive with no prior explosion, can be compared to other flights to find similarities and differences in patterns. For example, TWA Flight 800 was also a high impact crash with no survivors however, Flight 800 exploded in mid-air prior to crashing into the Atlantic Ocean. Unlike Flight 587, the TWA 800 investigators found no correlation between severity of injury and structural damage or seat location and no predominant injury to the upper or lower extremities consistent with an explosion (Vosswinkel and Brathwaite 1999). In addition, understanding how bodies fragment during a high velocity impact may aid anthropologists in disasters to re-associate remains during triage while sorting through commingled and fragmented remains.

#### References:

- <sup>1</sup> Vosswinkel, J.M., JE; Brathwaite, CE (1999) *Critical Analysis of Injuries Sustained in the TWA Flight 800 Midair Disaster*. The Journal of Trauma 47(4): p. 617-621.

#### Aircraft Crash, Fragmentation Patterns, Multiple Fatality Incident