Chapter 17
Resolving Commingling Issues During the Medicolegal Investigation of Mass Fatality Incidents

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By definition, mass fatality incidents result in numerous deaths occurring over a relatively narrow time frame. These events produce complex multidisciplinary investigative challenges (Labovich et al. 2003; Ludes et al. 1994; van den Bos 1980). From a medicolegal perspective, investigators seek to identify decedents, resolve cause of death, and assist with determining the cause of the event (Wagner and Froede 1993). Oftentimes, severe fragmentation and commingling of human remains are the byproducts of the causative forces and pose significant challenges to investigators (Sledzik and Rodriguez 2002). In a mass fatality context, the overarching tenet regarding commingling is that human remains with no anatomical/physical connection must be considered to be commingled. This principle also applies to remains that are spatially associated but present no valid anatomical connection. From the perspective of the forensic investigator, resolving commingling, and ultimately decedent identification, requires careful management of both the human remains and the data generated during recovery and postmortem examination. This chapter examines effects of fragmentation and commingling on the identification process and discusses the role of triage during the postmortem data collection process as a means to facilitate recognition and reassociation of commingled remains.

Identification

Identifying human remains is a primary investigative objective for legal, cultural, and scientific reasons. Family members of the deceased require identification for insurance, wills/probate, child guardianship, and remarriage (Wagner and Froede 1993). From an investigative perspective with aircraft incidents, aircrew identification and injury pattern analysis are often instrumental for determining and evaluating actions of the aircrew at the time of the accident (Midda 1974; Read and Pillay 2000; Taneja and Wiegmann 2003). In addition, correlating passenger injuries with seating assignments may aid incident reconstruction and evaluation of safety equipment (Armstrong et al. 1955; Cullen and Turk 1980; Li and Baker 1997; Vosswinkel et al. 1999). More broadly, the humanitarian and moral obligations to
identify the dead are nearly universal. State, national, and international laws govern the status of decedents, the need to identify the dead, and the status of unidentified remains (PAHO 2004).

Mass fatality investigators often rely on a combination of positive and presumptive methods during the identification process. Ultimately, positive identification requires comparing the unique biological attributes that are a component of the decedent’s antemortem record with those biological characteristics observed during postmortem analysis. Fingerprints, odontological evidence, the presence of surgical implants, anatomical anomalies, and, most recently, DNA methods, are utilized for positive identification. Presumptive identifiers such as associated personal effects and the biological profile (i.e., sex, age, ancestry, stature, and characteristics of individuation) often provide an identification hypothesis that can be accepted or rejected based on a comparison of unique biological attributes. Presumptive identifiers can also permit identification by exclusion in closed populations when all decedents in a definable category are accounted for.

Closed population mass fatality incidents are typified by commercial aircraft accidents, where relatively accurate passenger manifests are available soon after the accident. In a closed population event, the goal is to account for all potentially identifiable remains for each decedent. Often, this approach does not require analysis of all remains, just those that have a potential to be identified. With open decedent populations, typified by natural disasters, neither the number of victims nor their names are known. Under these circumstances, general practice is to analyze and, if possible, identify every fragment recovered. This is the only way to provide an accurate accounting of decedents. Such an approach requires more time and cost, as DNA methods are often the only way to provide this information.

**Fragmentation, Reassociation, and Identification: Influencing Parameters**

The condition of human remains, particularly the fragmentation severity, will have a substantial effect on fatality management, decedent identification, and reassociation of commingled remains. In this chapter, fragmentation severity is described using the “fragmentation index,” which is simply the ratio of recovered remains to the number of decedents. Table 17.1 demonstrates the range of fragmentation severities observed during the investigation of several recent aviation accidents. Fragmentation severities range from a low of 1.3 remains per decedent resulting from the crash of the Executive Air BAE J-31 turboprop on approach to landing, at an estimated speed of approximately 174 feet per second and an impact angle of 60 degrees nose-down (NTSB 2002). The other end of the fragmentation severity spectrum is represented by the ValuJet Flight 592 DC-9 jet that impacted terrain at a 70–80 degree angle traveling approximately 675 feet per second (Mittleman et al. 2000). A total of 4,282 fragments was recovered, representing 38.9 remains per decedent.