B178 What Happened to Flight MH17?

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After attending this presentation, attendees will better understand how the origin of an airplane explosion may be determined and, more specifically, what brought down Flight MH17 and how Disaster Victim Identification (DVI) processes can benefit from the inclusion of new technologies.

This presentation will impact the forensic science community by familiarizing attendees with some of the results of the initial investigation into the crash of Flight MH17. Non-accidental airplane crashes are relatively rare events. This presentation will discuss how to obtain and examine relevant materials from one of these events. This presentation will also explain the benefits of designing DVI processes to include forensic examinations; in particular, the novel inclusion of mobile Computed Tomography (CT) scanners, dual-beam X-ray scanners, and hand-held X-ray scanners.

At approximately 3:15 p.m. on July 17, 2014, Malaysia Airlines Flight MH17 from Amsterdam to Kuala Lumpur crashed in the vicinity of Hrabove in the eastern Ukraine province of Donetsk. All 298 passengers and crew were killed. Initial reports hinted of a non-accidental cause of the crash. At the time of the crash, an armed conflict between Ukrainian military and armed separatist forces was taking place in the crash area, which precluded the possibility of examinations at the crash site.

One week later, on July 23, 2014, the first human remains arrived in the Netherlands. At the military base in Hilversum, a disaster mortuary had been established at the Corporal Van Oudheusdenbarracks. The DVI process took place at this location.

Prior to start of the DVI process, plans were made to include forensic examinations within the DVI process, as this might be the only opportunity to obtain forensic evidence to determine what happened to Flight MH17; however, the DVI process took top priority as it could not be impeded as a result of the forensic examinations.

The multidisciplinary approach used at the Netherlands Forensic Institute (NFI) to examine invasive traumas led to a plan that included the use of a mobile Computed Tomography (CT) scanner, a dual-beam X-ray scanner, and a portable X-ray scanner to screen the human remains for foreign (metal) fragments.[1-3] It was thought that once recovered fragments had been identified as being non-airplane in nature, this information could be combined with a passenger seating map to determine the origin of the explosion.

The recovered fragments were sent to the NFI, where they were tested for explosive residues. After the fragments were cleaned, they were visually examined. Those of unknown origin were further analyzed with Scanning Electron Microscopy in combination with Energy Dispersive X-ray (SEM/EDX) analysis. This analysis confirmed that multiple fragments were unalloyed steel on which molten and resolidified layers were present. With the use of a Focused Ion Beam (FIB), local cross-sections were made and it became clear there were aluminum and glass layers present on the particles. The elemental composition of the glass layers revealed zirconium was present in the glass. A subsequent query of the NFI glass database disclosed only a single hit of glass containing zirconium: a cockpit window.

In December 2014, parts of the wreckage arrived at the Gilze-Rijen airbase in the Netherlands. From the wreckage, more fragments were recovered and analysis determined the same results as those obtained from the human remains. Reference samples from various glass sources in the airplane verified that only the outer and inner layers of the cockpit windows were made of zirconium-containing glass. This means that the steel fragments originated outside of the airplane and that probably a missile brought down Flight MH17.

Reference(s):

1. Vermeij et al. Analysis of microtraces in invasive traumas using SEM/EDS. *Forensic Sci. Int.* 214(1) pp. 96-104.
2. Zoon et al. Microanalysis of Invasive Traumas - an integrated multidisciplinary approach into the manner of death. Chin. *J. Forensic. Sci.* (2012), 4, pp. 54-61.
3. Vermeij et al. Microscopic Residues of Bone from Dissolving Human Remains in Acids. *J. Forensic Sci.* 60(3) 770-776.

MH17, Explosion, DVI