

65 occurrences of smoke puffs were documented along with seven times when the one-minute long smoke releases took place.

The evidence suggests that these smoke puffs resulted from pressure pulses generated within the tower and transmitted to other locations. It is considered likely that, while these pressure pulses were of sufficient magnitude to affect smoke flows over multiple faces and floors, they were much too small to affect the tower's structural components. For most of the smoke puffs, there was no visual indication of the event that generated the pressure pulse or its location. In a few cases, such as when molten metal poured from the tower, circumstantial evidence indicated that the puffs were associated with specific observed events.

The roughly one-minute-long periods of heavy smoke flow were easily distinguished from the smoke puffs due to their persistence and the presence of flames. The short-term release of large amounts of smoke along with external flaming over large areas of a building façade is not a typical building-fire behavior. Solid-fueled fires in buildings more typically go through the stages of growth, sustained burning, and decay observed elsewhere in both towers. Burning of isolated pools of aviation fuel deposited inside the building during the aircraft impact is one likely explanation. Given the likelihood that a large amount of aviation fuel from the aircraft's starboard fuel tank was spread across the 79<sup>th</sup> floor during the impact, perhaps the most noteworthy observation on the east face was the absence of large fires on the 79<sup>th</sup> (with the exception of the debris pile on the north face) and 80<sup>th</sup> floors for the initial 25 min of the fires. The fire behaviors during the short periods of heavy smoke release are those expected following the sudden ignition and rapid burn out of aviation fuel at interior locations within the tower. The identification of seven such occurrences suggests that, if the aviation fuel was indeed responsible, it had collected at multiple locations that separately ignited and burned.

Numerous visual observations suggest that important changes, which might have had structural relevance, were taking place in WTC 2 in the period following the aircraft impact until collapse. These observations included hanging objects, at least some of which, based on appearance, were likely locally dislodged floor slabs that had settled down to locations below the spandrel; at several locations on the north and east faces, changes in the positions of the hanging objects during the period; the occurrence of numerous pressure pulses identified by smoke and/or dust puffs generated over multiple windows and floors; the appearance of molten metal pouring from the tops of open windows; and bowing of the outer steel framework on the east face.

The general picture that emerges from the observations is that WTC 2 possibly underwent a prolonged series of subtle structural changes that began shortly after the aircraft impact and that these changes continued until the tower collapsed. Presumably, these changes occurred as the structure adjusted to the initial damage inflicted by the aircraft and associated fireballs and the additional deformation caused by the fires that subsequently developed. While there was similar direct evidence for structural changes in WTC 1 as for WTC 2, e.g., bowing columns, events, such as smoke puffs, that might be possible telltales for internal changes taking place within the tower, were considerably less frequent in WTC 1 than observed for WTC 2.

It has been noted that the fire events in WTC 1 and WTC 2 had different characteristics. These differences extended to human behavior, which provided additional indications about these differences. In WTC 1, people broke out numerous windows above the immediate floors that were burning and were often observed in open windows. While some windows were broken open in WTC 2, the locations were