

The 2003 Boeing memorandum also mentioned that the aircraft carried approximately 70 kg (150 lb) of halon 1301. If dispersed over the volume traced by the fuselage inside the buildings, the mole fraction would be four orders of magnitude lower than that needed to suppress a flame, 0.03.

Table 3–7. Importance of combustible contents of aircraft.

Category	AA 11 (WTC 1)	UA 175 (WTC 2)
Exterior width of fuselage ^a	5.03 m (16.5 ft)	5.03 m (16.5 ft)
Length of fuselage traverse	18 m (69 ft). Assumes that the aircraft impacted orthogonally on center and stopped within the core.	65 m (210 ft). Assumes that the aircraft impacted slightly to the east and at a slight angle to the east and reached the far side of the floor.
Floors entered by fuselage	95 & 96	80 & 81
Floor area traced by fuselage	180 m ² (1,940 ft ²)	650 m ² (7,000 ft ²)
Mass of combustibles in building on that floor space, assuming fuel load of 20 kg/m ² (4 lb/ft ²)	3,600 kg (7,800 lb)	13,000 kg (28,000 lb)
Mass of combustibles in the aircraft (Table 3–7)	12,100 kg (25,800 lb)	12,500 kg (27,600 lb)
Fraction of mass in aircraft entry path from aircraft combustibles	75 %	50 %

a. www.boeing.com/commercial/767.

3.4 INSULATION

3.4.1 Identification

The properties and presence or absence of thermal insulation used to retard the heating of structural elements in the WTC buildings could certainly have played a prime role in determining how long the structural elements resisted the fires on September 11. Table 3–8 (condensed from NIST NCSTAR 1-6) summarizes the types of sprayed fire-resistive materials (SFRMs) and where they were in use in the towers on September 11. In addition, most of the core columns were at least partially protected with box structures of gypsum wallboard.

3.4.2 Thermal and Mechanical Properties

NIST measured the cohesive strength of BLAZE-SHIELD DC/F and its adhesive strength to steel substrates with and without primer. These results are reported in NIST NCSTAR 1-6A. Combined with the information generated on the impact intensity of the aircraft (NIST NCSTAR 1-2) and estimates of the condition of the insulation prior to those impacts, these results enabled estimates of the degree of insulation that was not in place during the 102 min and 56 min that the fires burned in WTC 1 and WTC 2, respectively. The results became boundary conditions for the calculations reported in Chapter 5 of this report.

NIST also obtained samples of the two types of sprayed insulation and four types of gypsum wallboard and sent them to testing laboratories for determination of their thermal conductivity, density and heat capacity, all as a function of temperature from ambient. The sprayed material data were for 25 °C to