

# Non-animated Visualization Aids to Assist in Understanding the Demolitions of the World Trade Center Twin Towers

by Anon, November 27, 2007

**Abstract:** The volume of jet fuel that remained in each of the World Trade Center Twin Towers after the initial fireballs on September 11, 2001, would fit into a mid-size U-Haul® rental truck. This brief paper will quantify the volume of jet fuel that entered each of the Twin Towers and provide non-animated visualization aids of comparably-sized familiar items to assist the reader in understanding that this volume of jet fuel was inconsequential relative to the massive size of the Twin Towers, which were two of the largest buildings in the world.

## Introduction

The National Institute of Standards and Technologies (NIST) issued their [\*Final Report on the Collapse of the World Trade Center Towers\*](#) (NCSTAR 1) in September 2005, which included [\*Reconstruction of the Fires in the World Trade Center Towers\*](#) (NCSTAR 1-5) and [\*Computer Simulation of the Fires in the World Trade Center Towers\*](#) (NCSTAR 1-5F). NIST identified jet fuel as one of the two primary causes of the demolition of each of the Twin Towers (the other being the airplane impact).

In June 2007, Purdue University released a “scientifically based”, “state-of-the-art animated visualization” in support of the NIST reports. Purdue’s press release described this quantity of jet fuel as “[a flash flood of flaming liquid](#)”<sup>1</sup>. Purdue’s earlier press release from September 2006, announcing the completion of the simulation on which this animated visualization is based, includes the grossly erroneous statement, “We believe most of the structural damage from such aircraft collisions is caused by the mass of the fluid on the craft, which includes the fuel. Damage resulting solely from the metal fuselage, engines and other aircraft parts is not as great as that resulting from the mass of fluids on board. You could think of the aircraft as a sausage skin. Its mass is tiny compared to the plane’s fluid contents.”<sup>2</sup> In reality, and according to NIST, the mass of the empty Boeing 767-200ER airplane was 183,500 pounds.<sup>3</sup> According to NIST’s detailed quantitative report, *Computer Simulations of the Fires*, the greatest amount of jet fuel entered WTC 1 (North Tower), weighing 57,922 pounds, only 32% of the mass of the empty airplane.

Unfortunately, many, if not most, Americans remain under the mistaken impression that the Twin Towers were demolished, in large part, by the “flash flood of flaming liquid,” which purportedly demolished several 2’x4’ thick-walled steel box columns and melted, or at least substantially weakened the steel structure of the buildings. The objective of this brief paper is to correct that impression by providing non-animated visualization aids of comparably-sized familiar items to assist the reader in understanding how inconsequential this volume of jet fuel is relative to the massive size of the Twin Towers, which were two of the largest buildings in the world.

## Just How Much Jet Fuel Entered Each of the Twin Towers?

In nine instances, NIST’s *Final Report* qualitatively refers to “fuel-laden” airplanes as if to emphasize the airplanes were carrying a tremendous amount of fuel. However, NIST’s detailed quantitative report, *Computer Simulation of the Fires*, reveals that on impact with the

Towers, Flight 11 and Flight 175 were respectively carrying only approximately 36% and 31% of full fuel capacity.

The NIST reports offer varying estimates of the amount of jet fuel that was on the airplanes. One passage states that on impact Flight 11 “likely contained about 10,000 gallons of Jet A fuel (66,700 pounds)”<sup>4</sup>. Another passage states that Flight 175 contained “about 9,100 gal (62,000 lb)”<sup>5</sup>. However, these relatively qualitative descriptions are contradicted by NIST in more detailed quantitative information described below.

Similarly, varying qualitative estimates are provided of the jet fuel that remained inside each of the Twin Towers immediately after the initial fireballs burned off. The *Final Report* states in a few places “well over half of the jet fuel remained in the building, unburned in the initial fires.” The *Reconstruction of the Fires* report provides an estimate for Flight 11 which impacted the North Tower of “about two thirds of the jet fuel remained inside the building to burn later.”<sup>6</sup> The *Reconstruction of the Fires* report does not provide a simple statement of how much jet fuel remained in the South Tower. The *Final Report* states, “As in WTC 1, less than 15 percent of the jet fuel burned in the spray cloud inside the building. Roughly 10 percent to 25 percent was consumed in the fireballs outside the building. Thus, well over half of the jet fuel remained after the initial fireball.”<sup>7</sup>

This paper relies on the jet fuel estimates that are provided in NIST’s detailed quantitative report, NCSTAR 1-5F *Computer Simulation of the Fires*.<sup>8</sup> In that report, jet fuel estimates are provided for each of the impact floors, accurate to the gallon! It states:

“Tables 5-3 and 5-4 present the predicted fuel distributions from the impact analysis. Of the total amount of fuel distributed to each floor, only 40 percent was used in the simulations. The reasoning behind this estimate followed that of the Federal Emergency Management Agency (FEMA) study (McAllister 2002). It has been estimated by various forms of analysis (Zalosh 1995; Baum and Rehm 2002) that roughly 20 percent of the jet fuel was consumed in the fireballs that were observed outside of the buildings within seconds of impact. The authors of the FEMA report suggested that half of the fuel not consumed in the fireballs could have flowed away, presumably down the elevator shafts and stairwells based on eyewitness accounts. Some additional discussion of the fireballs may be found in NIST NCSTAR 1-5A.

Table 5-3 Jet Fuel Distribution, WTC 1 (North Tower, impacted at 8:46 a.m.)

Floor	Liters	Gallons
92	739	195
93	1,531	405
94	8,864	2,342
95	7,216	1,906
96	7,500	1,982
97	5,853	1,546
98	909	240
99	256	68

Table 5-4 Jet Fuel Distribution, WTC 2 (South Tower, impacted at 9:02 a.m.)

Floor	Liters	Gallons
78	3,125	826
79	7,841	2,072
80	3,069	811
81	7,556	1,996
82	5,681	1,500
83	795	210

The jet fuel consumption estimate put forth by the FEMA team was used in the model because (1) no evidence or analysis emerged that significantly altered the FEMA estimate, and (2) **the simulations were insensitive to both the amount and distribution of the jet fuel. Sensitivity studies showed that the amount of fuel spilled in the simulation only**

**influenced the results of the first few minutes; the long-term behavior of the simulated fires was unaffected.** [Bold added for emphasis by author.]

NIST has divided the jet fuel that arrived at the buildings into three categories.

- that which was burned up immediately in the initial fireballs (20% of total)
- that which remained on the impacted floors (50% of jet fuel remaining after fireballs)
- that which “flowed away, presumably down” (50% of jet fuel remaining after fireballs)

	WTC 1 (North Tower)			WTC 2 (South Tower)		
	Gallons	Cubic Feet	Mass (lbs)	Gallons	Cubic Feet	Mass (lbs)
Total Jet Fuel	8,684	1,161	57,922	7,415	991	49,458
20% Burned in Fireballs	1,737	232	11,586	1,483	198	9,892
Total Jet Fuel after Fireballs	6,947	929	46,336	5,932	793	39,566
Remaining on Impact Floors	3,474	465	23,172	2,966	397	19,783
Flowed away	3,474	465	23,172	2,966	397	19,783

Conversion Factors: 1 US gallon = 0.13368 cubic feet. NIST used a weight of jet fuel of 800 kg/cubic meter, which equates to 6.67 pounds per gallon (~20% lighter than water).

The 929 cubic feet volume of jet fuel that remained in WTC 1 and 793 cubic feet in WTC 2 are inconsequential amounts relative to the size of the buildings and could not have caused the demolition of these immense buildings through either fire or structural damage.

This contention is made even more unbelievable, as NIST assumes that half of that jet fuel “flowed away” from the impact floors and did not contribute to the fires that initiated the building collapses. We are asked to believe that 2,966 gallons of jet fuel, essentially kerosene, caused the collapse of the South Tower. NIST apparently even has difficulty accepting its own conclusion and states in the passage quoted above, **“the simulations were insensitive to both the amount and distribution of the jet fuel. Sensitivity studies showed that the amount of fuel spilled in the simulation only influenced the results of the first few minutes; the long-term behavior of the simulated fires was unaffected.”**

### Just How Big Is That? – Familiar Examples of Comparable Volumes

To assist the reader in comprehending the 900 cubic feet volume of jet fuel that remained in each of the buildings after the fireballs, three familiar examples are provided.

- *A single standard 10'x10' office cubicle filled to 9 feet.* Approximately 300 such cubicles plus walkways and amenities could have been contained on each of the 110 floors (40,000 square feet) of each Twin Tower.



Typical Office Cubicle



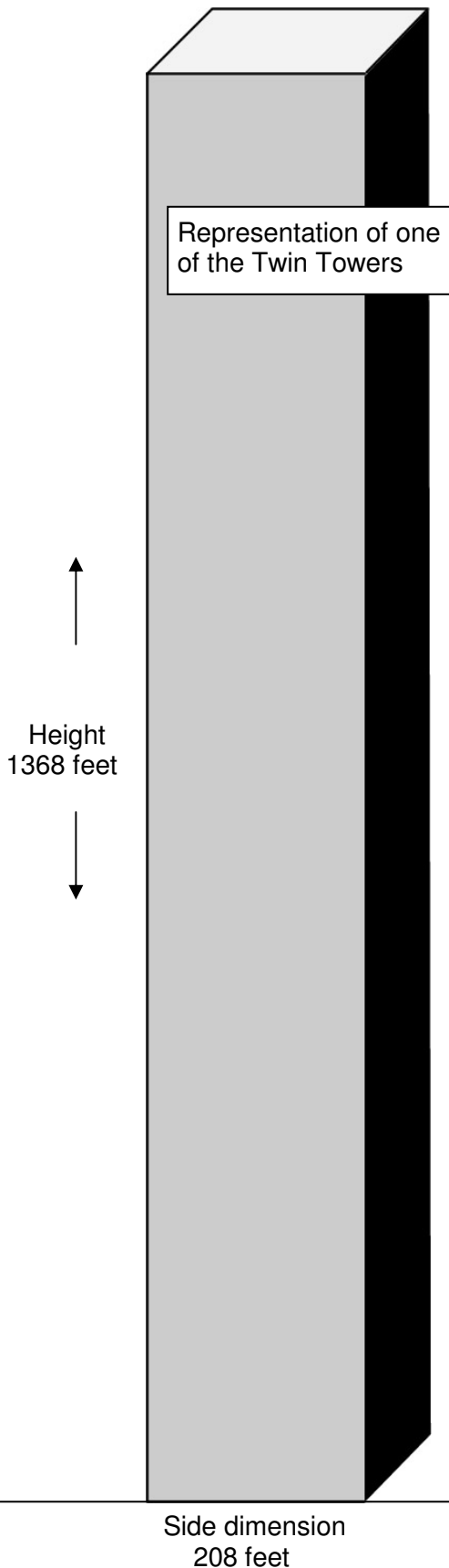
WTC Twin Tower Interior Floor

- A mid-size U-Haul<sup>®</sup> truck. The [17' Easy Loading Mover rental truck](#) has a box volume of 855 cubic feet. Total cab plus box volume is over 900 cubic feet. U-Haul also offers two larger trucks with volumes of 1,401 and 1,592 and two smaller trucks. The 17' model is pictured in the middle below.



- A mid-size do-it-yourself above ground pool. Below is a photo of an Intex<sup>®</sup> [18' diameter, 4' tall above ground pool](#). Volume of an 18' diameter, 4' tall pool is 1,017 cubic feet. Intex also offers a model with twice this volume.





In the scale drawing on this page, the 900 cubic feet volume of the jet fuel is represented by the correctly-scaled 10x10 Office Cubicle, the 17' U-Haul Truck, and the 18' diameter Above-ground Pool that appear at the bottom of the page. It is clear that the 900 cubic feet of jet fuel that remained in each of the World Trade Center Twin Towers after the fireballs was insignificant relative to the 59,185,000 cubic feet volume of each Tower. The volume of each Tower is 65,000 times larger than the fuel.

The mass of one Twin Tower is variously estimated to be between 250,000 and 500,000 tons, a factor of 11,000 to 22,000 times greater than that of the jet fuel.

If 900 cubic feet of fuel was spread evenly over just one 40,000 square feet floor of a Tower, it would result in a film 0.27 inches thick, about the thickness of a pencil.

If 900 cubic feet of fuel was spread over all 110 floors of one Tower, it would result in a film 0.00245 inches thick, which is less than the thickness of one sheet of paper.

The belief that the kinetic energy of this inconsequential amount of fuel arriving at 500 mph could cause significant structural damage to these immense buildings is ludicrous. Similarly, the belief that burning this inconsequential amount of jet fuel (essentially kerosene) could cause any significant heating of the structural steel of this building is preposterous.

Even NIST admits in its *Final Report*, "The initial jet fuel fires themselves lasted at most a few minutes."<sup>9</sup> The only remaining source of fuel for the fires was common office furnishings. The idea that a few floors of common office furnishings burning for 56 minutes could result in the demolition of the South Tower is phenomenally ludicrous. If true, then every high-rise steel tower ever constructed should be immediately demolished as a hazard to public safety. Of course, that is unnecessary because **no** high-rise steel structure has ever collapsed as a result of fire.

The observed demolition of the Twin Towers could not have resulted from fires caused by the burning jet fuel and/or office furnishings. It could only have been accomplished through the action of some other much more energetic agent.

The most obvious explanation for the demolition of the Twin Towers is precisely timed detonations of precisely located explosives, placed prior to September 11, 2001.

*This analysis was provided at no cost to the American taxpayer.*

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End Notes

<sup>1</sup> Purdue University Press Release: *Purdue creates scientifically based animation of 9/11 attack* June 12, 2007 <http://news.uns.purdue.edu/x/2007a/070612HoffmannWTC.html>

<sup>2</sup> Purdue University Press Release: *Scientists and engineers simulate jet colliding with World Trade Center* September 11, 2006  
<http://news.uns.purdue.edu/html4ever/2006/060911.Sozen.WTC.html>

<sup>3</sup> National Institute of Standards and Technologies *Final Report on the Collapse of the World Trade Center Towers* (NCSTAR 1), page 20 September, 2005  
<http://wtc.nist.gov/NISTNCSTAR1CollapseofTowers.pdf>

<sup>4</sup> National Institute of Standards and Technologies *Final Report on the Collapse of the World Trade Center Towers* (NCSTAR 1), page 20 September, 2005  
<http://wtc.nist.gov/NISTNCSTAR1CollapseofTowers.pdf>

<sup>5</sup> National Institute of Standards and Technologies *Final Report on the Collapse of the World Trade Center Towers* (NCSTAR 1), page 38 September, 2005  
<http://wtc.nist.gov/NISTNCSTAR1CollapseofTowers.pdf>

<sup>6</sup> National Institute of Standards and Technologies *Reconstruction of the Fires in the World Trade Center Towers* (NCSTAR 1-5), page 9 September 2005  
<http://wtc.nist.gov/NISTNCSTAR1-5.pdf>

<sup>7</sup> National Institute of Standards and Technologies *Final Report on the Collapse of the World Trade Center Towers* (NCSTAR 1), page 42 September, 2005  
<http://wtc.nist.gov/NISTNCSTAR1CollapseofTowers.pdf>

<sup>8</sup> National Institute of Standards and Technologies *Computer Simulation of the Fires in the World Trade Center Towers* (NCSTAR 1-5F), page 56 September 2005  
<http://wtc.nist.gov/NISTNCSTAR1-5F.pdf>

<sup>9</sup> National Institute of Standards and Technologies *Final Report on the Collapse of the World Trade Center Towers* (NCSTAR 1), page 182 September, 2005  
<http://wtc.nist.gov/NISTNCSTAR1CollapseofTowers.pdf>