The Sustainability of the Controlled Demolition Hypothesis for the destruction of the Twin Towers

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Abstract: In the past two years there has been an exponential growth in the number of people questioning the explanations we have been given, by official U.S. government bodies, concerning the collapses of the three WTC buildings in NYC on 9/11/2001. It is probably safe to say that much of this growth can be attributed to the Internet publishing of a paper by Physics Professor Steven Jones in November 2005, which put forth the hypothesis that the Twin Towers and WTC7 were actually demolished with pre-positioned cutter charges.[3] This hypothesis is in tension with the present government explanation of impact damage and fires being the causes for the complete collapses of the buildings. My intent here is to show that any honest and objective look at all of the theories, for the destruction of the twin towers, including the present government explanation, will cause one to realize that only the controlled demolition hypothesis is sustainable. I believe an honest look at the evidence will convince anyone that the controlled demolition hypothesis provides the best explanation for the complete collapses of the towers, as well as the damage to the buildings and objects surrounding them. The remarkable collapse of WTC7 seems to have had a separate cause in its own controlled demolition. Video of the collapse of WTC7 can be viewed quickly at http://www.journalof911studies.com/beginners.html before continuing, as it plays a part in understanding what probably occurred in NYC on Sept. 11, 2001.

It can be shown that due to the design and volume of the towers, the aircraft impacts and fires could not have been enough to cause them to collapse. The link below will provide an idea of how the towers were constructed, with photos seen in articles from the Engineering News Record at the time they were built.

http://911research.wtc7.net/mirrors/guardian2/wtc/eng-news-record.htm

The three points outlined below then need to be understood to follow this line of reasoning:

- The twin towers were designed to handle multiple loads: their own weight (dead loads), live loads (due to people, furnishings, and equipment), wind loads, ice loads, and seismic loads. The dead and live loads are normal gravity loads. The central core was designed to handle approximately 50% of the normal gravity loads of the building, with the perimeter structure designed to take the remaining 50% of the normal gravity loads, and all of the wind, ice, and seismic loads. While wind loads are usually quite low, tall structures need to be designed to handle extremes. The towers where designed to handle the overturning moment and shear stress generated by 100 mph winds acting on their considerable surface area and height.[2] Although heavy icing would be rare, the towers would still need to withstand the extra weight, which glaze ice would bring at 56 lbs./ft^3, not insignificant on a structure with approximately 1.3 million square feet of outside surface area. Seismic loads can generate horizontal accelerations, which would cause high overturn moments similar to those caused by high wind loads. Due to the need to withstand rare high wind, ice, and seismic loads, the tower's perimeter columns had a minimum factor of safety of 5.00, when considering normal gravity loads only.[1] The central cores were designed with a minimum factor of safety of 3.00, since they took normal gravity loads only.[1] Prior to the attacks, on a low wind, warm sunny day, with no earthquakes, such as Sept. 11, 2001, the steel frame in each tower would have had no more than 25% of its total load sustaining capacity used.

- Upon impact with the buildings, the wings, tail, and engine fan assemblies of the aircraft would have been shredded prior to completely entering the central core area of the buildings. NIST analyses show this to be probable. This would leave only the fuselage, center portions of the engines, and the landing gear, with greatly diminished energies, to cause damage to the central core columns.[13, 14] The central cores were comprised of 47 large steel columns interconnected by horizontal beams at every floor in a three-dimensional matrix, encompassing a plan area of 137 feet x 87 feet. The fuselages of both Boeing 767-200ER aircraft, which hit the towers, were 16.5 feet in diameter,[4] and the center portions of the engines were approximately 4 feet in diameter. The spacing of the central core columns ranged from approximately 11 to 21 feet apart,[14] so by volume alone there would be a limited number of columns, which the remains of the fuselage, engines, and landing gear could contact. The damage to the perimeter columns is visible in photographs and it is known that no more than 20% of the perimeter columns were affected in either tower. It is the damage to the core columns, which was not visible, that needs to be scrutinized. Analyses can be done to show what the remaining energies and volumetric probabilities would be, for impact damage to occur to the core columns. NIST performed analyses of this type and in their nominal or base cases, for both towers, less than 20% of the central core columns were severed or heavily damaged.

- The towers were designed as virtual structural pyramids, with the wall thickness of the columns being thicker at the bottom and thinning with greater vertical height location due to the changes in loading. Since the tower columns varied in wall thickness, depending on their vertical location, it could be ascertained which columns were in the aircraft impact and fire affected areas. With it being important to know the actual temperatures that the columns experienced, in the fire affected areas, NIST used the known microstructure characteristic of spheroidization to determine those temperatures.[8] Temperature will change the spheroidization of the steel microstructure in a linear, predictable, and permanent way. In their testing of the steel, from the fire affected areas, NIST found that only a few percent of the tested items ever experienced temperatures above 250° C (482° F) and none above 600° C (1,112° F). None of the central core steel tested showed it had experienced temperatures above 250° C (482° F). The chart below, which shows the proportional loss of strength in steel, as it's temperature is increased, is from Corus Construction, with temperatures in degrees C.
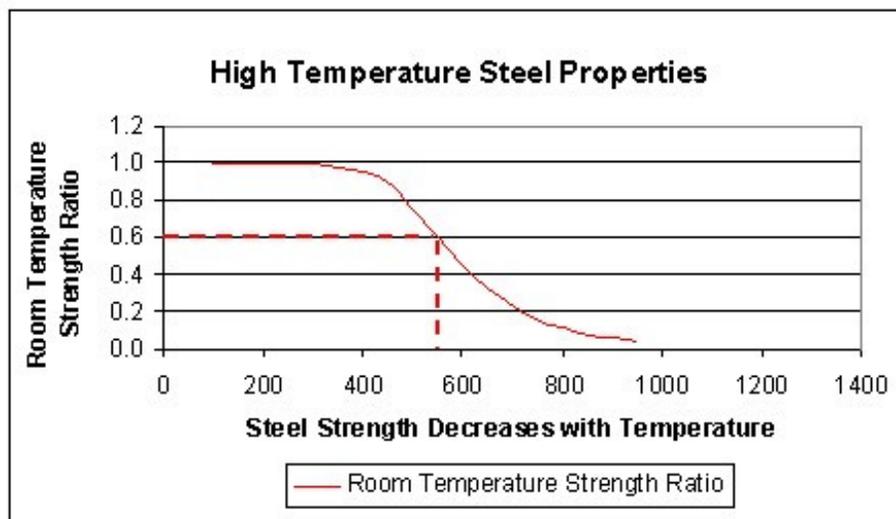
As the chart shows, steel does not lose any of its strength until its temperature rises above 350° C (662° F), and only loses half of it at 600° C (1,112° F). The evidence thus shows that no more than a few percent of the steel structural elements lost any strength due to the fires. While NIST includes this data in their report, it is not discussed in the report's conclusion and is essentially supplanted with an argument,

based on computer modeling, that higher steel temperatures existed, even though there is no physical evidence for it. The amount of jet fuel, which actually entered the towers, can be approximated to be about half of the 10,000 gallons on board each aircraft, due to the fireballs, which erupted on impact. Spreading the remaining 5,000 gallons, in each case, over just one floor of one of the towers (a one acre area), results in a jet fuel layer of approximately .015 feet or 3/16 of an inch. The NIST report admits that this thin layer would have burned up in minutes, leaving nothing more than office materials to fuel the fires. The fact that high temperature effects were not found in the microstructure of the steel should not be surprising.

To summarize, it cannot be shown that any more than 20% of the columns, in either tower, had their strength significantly affected by the aircraft impacts and fire. That leaves approximately 80% of the columns, in both cases, with their full strength intact. Grid like structures, such as the twin towers, redistribute loads when individual columns or beams are damaged. This occurs in a bridge like fashion, since the columns are interconnected horizontally at every floor. In the reference section of this article, it is shown that if 20% of the perimeter and central core columns were totally incapacitated, 48 perimeter columns and 9 central core columns, the perimeter wall and central core would have maintained factors of safety of at least 4.00 and 2.40, respectively. This means that for the buckling stress of the core columns to be reached, and collapse to even be possible, the actual steel in all of the remaining 38 core columns would need to reach 650° C (1202° F), to lose 60% of their strength. This is not a likely scenario and, as stated earlier, there is no physical evidence for these very high steel temperatures. It would appear that the initiation of a collapse, due to fire weakening, was improbable.

So how then did the towers collapse?

The answer is that another mechanism must have caused the collapses.

Over the last couple of years there have been several alternative collapse causation theories proposed, to supplant the insufficient fire and impact damage theory, some more serious than others, and they are:

1. The towers were destroyed via controlled demolition with the use of incendiaries and explosives.
2. A directed energy weapon was used to destroy the towers.
3. Mini-nukes were used to destroy the towers.

The second and third of these proposed causes have both been shown to lack a basis, by published scientific papers. These papers explain away perceived anomalies, and provide reasons for the observations, which are more natural and consistent with the controlled demolition hypothesis for the destruction of the towers. To date these papers have not been challenged in writing, or shown to be incorrect in any way. These papers can be found at http://www.Journalof911Studies.com.

The physical evidence for the first theory, controlled demolition, is due to the characteristics of the twin tower collapses. In one of his many writings on the subject of Sept. 11, 2001, Dr. David Ray Griffin lists the eleven characteristics of controlled demolition, which both of the towers exhibited in their respective collapses.

Sudden Onset	*Dust Clouds*	*Molten Steel*
Straight Down	*Horizontal Ejections*	*Sliced Steel*
Almost Free-Fall Speed	*Sounds Produced by Explosions*	*Demolition Rings*
Total Collapse	*Pulverization of Concrete and Other Materials*	

Dr. Griffin's full article 'The Destruction of the World Trade Center: Why the Official Account Cannot Be True" can be found at http://911review.com/articles/griffin/nyc1.html

Any close viewing of video of the collapses of the towers will physically show most of the characteristics of controlled demolition listed above. Witnesses, photos, and taped audio from that day, have attested to molten metal, demolition rings, sliced steel, and sounds produced by explosions.

It was the revelation of the presence of large quantities of molten metal, in the rubble of all three buildings which collapsed in NYC on Sept. 11, 2001, which caused Dr. Jones in 2005 to begin to question whether the present U.S. government explanation, for the collapses, was sufficient. It is provable that the molten metal in the rubble was not aluminum and that diffuse flame fires cannot achieve temperatures sufficient to melt steel. Steel can only be melted in the controlled environment of a blast furnace, with the use of incendiaries, an electric arc welder, or an oxy-acetylene torch. The amount of metal melted with an electric arc welder or an oxy-acetylene torch is small and does not produce large pools of molten metal.

There is very credible witness testimony of seeing, hearing, and feeling explosions, in many areas of the towers, both before and during the collapses. This testimony can be found in the Oral Histories of the 503 NYC firefighters and emergency personnel, who were on the scene that day and survived. Their testimony was taken and transcribed in late 2001 and early 2002 by order of the NYC fire commissioner. However, afterward the mayor of NYC repeatedly refused to release these testimonies to the public. They were only released due to a court order from the New York State Court of Appeals in August of 2005, after earlier court challenges had failed to gain their release. Amazingly, in spite of the existence of this testimony, there was no testing done for explosive residue on the steel structural elements during either the NIST or FEMA investigations of the building collapses. An article by Dr. David Ray Griffin discussing and quoting these Oral Histories can be found at

http://www.911truth.org/article.php?story=20060118104223192

It is also worth mentioning the fact that the twin towers were designed to take an impact by the largest aircraft at the time they were built. A white paper in the possession of the Port Authority of NY & NJ and dated February 3, 1964 describes the findings of an analysis, which says the towers would survive the impact of a Boeing 707-320B, with a 336,000 lb.max takeoff weight,[4] moving at 600 MPH. While the NIST report mentions this white paper, which discusses the analysis, they state that they were not able to find the actual analysis itself to review. The towers were hit with Boeing 767-200ER aircraft, which had 10,000 gallons of fuel on board for their trips to the West Coast of the U.S. from Boston. While the 767-200ER is rated at a 395,000 lb. max takeoff weight, this is for a full fuel load of 23,980 gallons, which would be used for a longer flight, as the aircraft had a 7,700 mile range.[4] Subtracting the weight of 13,980 gallons (at 6.825 lbs./gallon) from the max takeoff weight gives an aircraft weighing approximately 300,000 lbs.. NIST determined the impact speeds of the two aircraft, and they were 443 $\pm$ 30 MPH for the North Tower and 542 $\pm$ 24 MPH for the South Tower. Using these values and the equation

$$K = \frac{1}{2}mv^2$$

where K = kinetic energy
m = mass
v = velocity

it is found that the designed for 707-320B impact would have contained at least 1.26 times or 26% more kinetic energy than what either 767-200ER aircraft could have provided. The buildings obviously survived the impacts and thus the present theory we have been given is that fire caused the collapses. The fact that fires have never in history caused a complete vertical collapse of a steel framed high rise structure, let alone any built as robustly as the twin towers, has been amply documented.

Serious doubt of the present government explanation has been emanating from qualified credible people for the last several years.

Editor Bill Manning wrote in *Fire Engineering* magazine in 2002 that:

"Fire Engineering has good reason to believe that the 'official Investigation' blessed by FEMA… is a half-baked farce that may already have been commandeered by political forces whose primary interests, to put it mildly, lie far afield of full disclosure… Respected members of the fire protection engineering community are beginning to raise red flags, and a resonating [result] has emerged: The structural damage from the planes and the explosive ignition of jet fuel in themselves were not enough to bring down the towers….".

A letter was sent by Chuck Thurston, to Tucker Carlson of MSNBC, after he hosted Dr. Jones on one of his nightly shows in November of 2005. In it he lists ten very strong reasons for not believing the gravity driven collapse theory. It can be found at http://www.911research.com/letters/msnbc/index.html

The NIST report wants to tell us that it was the perimeter columns that buckled and caused the collapses. The report says this was due to their deflection and bowing, caused by fire affected sagging floor trusses pulling on them, and the central core itself sagging due to plasticity and creep.[6] The probable collapse sequences, as hypothesized by the NIST report, were issued at a press conference in NYC in April 2005. That press release, which also has aircraft impact simulations and a slide show, is available here.

http://www.nist.gov:80/public_affairs/releases/wtc_briefing_april0505.htm

It appears the press release and report want to say that the entire interior structure was sagging. It is interesting that neither the NIST press release or report seem to concern themselves with the fire testing of the floor deck and supporting truss assembly models, done under contract for them by Underwriters Laboratories. Full scale models of the floor deck and supporting truss assemblies were fire tested, under load, for two hours per ASTM E119. These tests did not produce a collapse and the 35 foot long trusses sagged just 3 inches at midspan, not likely enough to buckle the perimeter wall columns. In fact, NIST needed a non-evidence supported floor truss deflection of over 40 inches in their computer model to cause buckling of the perimeter columns. The central core columns great mass gave them a large heat capacity, and their interconnection gave them the ability to transfer heat to other areas of the building. The lack of high temperature evidence on the core columns is a testament to these points. These factors would have certainly made them even less susceptible to weakening than the floor trusses.

The NIST press release does not mention either the floor assembly fire testing or the low percentage of columns found to have experienced high temperatures in the microstructure testing. Both the press release and the report's conclusion attempt to point towards a theory of dislodged fireproofing materials as the reason for the alleged interior steel weakening. It is a virtual certainty that NIST did floor assembly fire testing without fireproofing, as a failure in that case would have proven their fire weakening hypothesis.[9] As there is no mention of failures during these tests, it is obvious that they apparently did not produce results which would back up the fire induced collapse theory. It is important to note that NIST has not been able to cause physical models to fail with the fire induced collapse theory.

It is instructive that the first visible signs of failure on the North Tower are when the antenna mast moves downward by ten to twelve feet before the perimeter roof line moves. This is indicative of the central core suddenly and completely failing first. If you haven't seen this watch it frame by frame at the link below.

http://911research.wtc7.net/wtc/evidence/videos/wtc1_close_frames.html

These frames don't show slow creep, they show sudden failure of the central core itself. They certainly don't show the perimeter walls failing first. If the central core failed first it would cause the floor trusses, not to sag, but to follow them downward. In this situation the other end of the floor trusses would apply a tremendous force and bending moment to the perimeter wall columns, causing them to bow inwardly and ultimately to fail. Some of the NIST photos of WTC1, showing inwardly bowed perimeter columns, are frozen frames taken from video. In these photos the roof of the building and antenna mast are not shown. It would be interesting to see these videos, without cropping of the roofline and antenna mast, to determine if the bowing of the perimeter columns occurs after the antenna mast starts moving downward.

The downward movement of the antenna mast, before the perimeter roofline, certainly makes it appear that the central core failed first and that it's failure is what caused the floor trusses to move downward and pull on the perimeter columns, causing them in turn to bow inwardly, buckle, and fail. The central core needed to have a loss of 67% of its original strength before any collapse initiation could begin to occur, and even then it could not be sudden, due to the strain hardening of the steel which would take place after initial yielding.[10] Since the evidence for column damage, due to aircraft impact and fire, cannot account for more than a 20% loss of strength in the central core, it does not appear any collapse initiation, let alone a sudden initiation, can be accounted for without some form of artificial weakening process or controlled demolition being involved. By demolishing the central core, the destruction of the building could also be done with the added advantage of the demolition being mostly hidden from view.

It would seem that any honest and objective look at; the design of the buildings, the true damage potential of the aircraft impacts, the physical evidence of the low steel temperatures, the physics of the collapses, the evidence of pools of molten metal in the rubble, and the emergency personnel testimony, should cause one to conclude that the towers must have been destroyed by a form of controlled demolition. In addition to what has been mentioned so far, there is also evidence of the presence of incendiaries, in the chemical analysis of the dust from an apartment and other locations near the towers, which have been analyzed by Dr. Jones and others.

The present U.S. government explanation, for the collapses of the buildings in New York City on Sept. 11, 2001, is simply not sustainable. The evidence which has surfaced, in support of the controlled demolition hypothesis, in the last two years, is overwhelming. The obvious controlled demolition of WTC7 at 5:20 PM on Sept. 11, 2001, proves that charges were pre-positioned in it, as there would not have been time to rig the building that day, especially with fires in it. With this in mind, the demolition of WTC7 lends considerable weight to the notion that charges could also have been pre-positioned in the twin towers. The spectacular collapses of the twin towers, which were most probably caused by controlled demolitions, shocked us all, and caused us to demand action against the foreign entities that we were told supported the hijackers. However, the placing of charges, to cause the controlled demolitions, would have required access to the interiors of the buildings, which outsiders were very unlikely to have had in highly secure buildings such as the towers and WTC7. It thus needs to be considered as to whether it is conceivable that the aircraft impacts were used as causal ruses, to allow the collapses to be blamed on outsiders.

If it were insiders who placed and detonated the charges in the buildings, one may wonder who would want people in Afghanistan and Iraq to be blamed if they didn't do it. It seems that a good hard look at the soon to be built U.S. oil company controlled gas and oil pipeline through Afghanistan to the Caspian area, and the privatization of Iraq's oilfields to U.S. oil companies, might be a start at solving that puzzle for oneself. Neither of these situations would have been possible, without the support of the American people, for the use of the U.S. military, to overthrow the previous governments of these countries.

The controlled demolition hypothesis appears to be the only realistic and sustainable explanation for the evidence observed in the very rapid complete collapses of the three buildings in NYC on Sept. 11, 2001. As it has not been considered by any of the U.S. government sponsored investigations thus far, it is essential that a new investigation be initiated to determine who would have had access to these buildings, with the ability to pre-position charges in them, and to detonate these charges during the emergency.

Endnotes and References:

1. **Determination of the minimum factor of safety against gravity caused vertical collapse of the Twin Towers after sustaining aircraft impact and fire damage, and a look at why the columns were unlikely to buckle.**

   The determination of a factor of safety for vertical loads, due to gravity, requires knowing the cross sectional areas of both the perimeter and central core columns, the actual building load being supported by the columns of each floor, and the yield strength of the steel used for those columns.

   While the actual detailed construction drawings of the twin tower design have been withheld from the public (the 2007 release of blueprints was for architectural floor plan views only). The actual cross sectional areas of the central core columns were made public due to the Spring 2007 release of the NIST SAP2000 data. This information has been posted on the Internet with graphic representations of the cross sections shown.[11]

   The determination of the cross sectional areas of the perimeter columns and the actual mass supported by the columns of an individual floor have been made possible by the publishing of a paper which determines the weight of the buildings and also the weight of the perimeter columns at each floor.[12]

   Of particular interest would be the factors of safety at the collapse initiation floors of both towers, which were the 98th floor and 82nd floors of the North and South Towers respectively. An important point to be made first is that the unit load and stress on each column on a specific floor, was kept the same, to eliminate differential deflections between the central core and perimeter wall and prevent warpage of the floor areas.

   Using the core column cross section data, the total area for the 98th floor core columns was 2,645 in.[2]. The perimeter column cross section is found by knowing the total weight of all 236 columns at that level, from the mass analysis paper by Gregory Urich[12], dividing by that number to find the weight of one column, dividing by the density of steel of .2836 lb./in.[3] to find the volume, and finally dividing the volume by the height of the column per floor. This results in a cross section of each perimeter column at the 98th floor of 15.6 in.[2] and a total 98th floor perimeter column area of 3,682 in.[2]. The mass above the 98th floor, from the mass analysis, is 68,295,000 lbs., giving a unit stress of 10,794 psi. The core columns had a yield stress of 36,000 psi, giving the core a 3.33 to 1 factor of safety, at the 98th floor. The perimeter columns varied in strength over the height of the building and at the 98th floor had a yield stress of 65,000 psi, giving the perimeter at the 98th floor a 6.02 to 1 factor of safety.

   A similar exercise for the 82nd floor produced factors of safety of 3.08 to 1 for the central core and 5.58 to 1 for the perimeter wall. Other floors were also checked, and it appears that the factor of safety for the central core was held to a minimum of 3.00 to 1 and the perimeter wall to 5.00 to 1, throughout the height of the buildings. The reader should be reminded here that the factor of safety shown for the perimeter is for when it is withstanding gravity loads only and it should be realized that the perimeter

was also intended to withstand high wind and seismic loads. However, on Sept. 11, 2001 there was very little wind and certainly no earthquakes.

In the case of the 98th floor, if 80% of the central core columns had their strength unaffected by damage and/or fire they would have provided a remaining factor of safety against vertical collapse of 2.67 to 1 and if 80% of the perimeter columns had their strength unaffected by damage and/or fire they would have provided a remaining factor of safety against vertical collapse of 4.81 to 1.

Buckling can occur at stresses below the compressive yield strength of a material. The critical buckling stress is dependent on the slenderness ratio of a column. The slenderness ratio is related to the cross sectional area of the column, it's stiffness, the unsupported length between the column's connections to supports, and whether the column's ends are fixed, hinged, or free. The end condition for the best buckling resistance is fixed at both ends, which all columns were in the towers throughout their height. The design would have followed AISC guidelines, which would have required that the critical buckling stress be nearly that of the compressive yield strength.[7]

To get an idea of the buckling resistance of the columns in the towers we can use the AISC guidelines in an example. The AISC manual separates columns into sidesway inhibited and sidesway uninhibited categories. This affects the effective length factor (K), which is used in determining the slenderness ratio (Kl/r) and finally the critical buckling loads and stresses. The greater the slenderness ratio the lower the buckling stress, so the effective length factor affects the buckling stress.

The link here http://cnx.org/content/m10746/latest/ shows how to determine the difference between sidesway inhibited and sidesway uninhibited and uses the AISC manual equations and nomographs for determining the effective length factor (K). The core columns and the perimeter columns of the towers would have all been sidesway inhibited. Example column AB would be representative of the perimeter columns and columns CD and FG of the central core columns.

As an example we will pick a random column such as core column 703 at the 98th floor and do a calculation to find Ga and Gb. In this example, the girder lengths are considered to be about 20 feet, and the same as the column in cross section, while also adding 5 inches of reinforced concrete 10 feet wide to the tops of the girders, since it would have been a composite system. The concrete adds to the moment of inertia of the girders and drops the Ga and Gb figures down somewhat. Using the sidesway inhibited nomograph, the effective length factor for this core column would have been approximately .65 to .70. Slenderness ratio is defined as the actual length of a column multiplied by the effective length factor divided by the radius of gyration or Kl/r. The radius of gyration is defined as the square root of the moment of inertia divided by the cross sectional area of the column.

In this case, the radius of gyration in the weakest axis for the W14 x 103 column is 3.72 inches. The unsupported length of the column would be approximately 130 inches. The slenderness ratio is thus

Kl/r = (.70 x 130)/3.72 = 24.5

where K = effective length factor
    l = actual unsupported length in inches
    r = radius of gyration in inches

Below a slenderness ratio of approximately 100, elastic or simple buckling will not occur in structural steel, but inelastic buckling can. A slenderness ratio for this column of 24.5 puts it far too low for

elastic buckling. The Johnson Parabola equation is used in engineering to determine the critical buckling stress for inelastic buckling and it is

$$Scr = Sy\{1-Sy/(4 \times Pi**2 \times E) \times (Kl/r)**2)\}$$

Where Scr = critical buckling stress
    Sy = yield strength of material
    E   = Young's modulus for the material
    Pi = 3.14159
    Kl/r = slenderness ratio

To find the critical buckling stress for inelastic buckling of an A36 steel column with a yield strength of 36,000 psi, a Young's modulus of 29,000,000 psi, and a slenderness ratio of 24.5, the equation is

$$Scr = 36,000 \text{ psi}\{1 - [36,000 \text{ psi}/(4 \times 3.14159**2 \times 29e6 \text{ psi})] \times 24.5**2\}$$
$$= 36,000 \text{ psi}\{1 - [(36,000\text{psi}/1.145e9) \times 600.25]\}$$
$$= 36,000 \text{ psi}\{1 – (.00003 \times 600.25)\}$$
$$= 36,000 \text{ psi}\{1-.019)$$
$$= 36,000 \text{ psi}(.981)$$

which is 35,316 psi or 98.1% of the yield stress. With 20% of the core columns destroyed or heavily damaged, on floors near the 98th floor, the remaining core columns would have maintained an average factor of safety of 2.63 to 1, with a unit stress increase from 10,800 psi to 13,500 psi. The critical buckling stress would not be achieved on the remaining intact columns without an increase in load of 263%, which was not possible, or a loss of strength of over 60% due to heating. To achieve this loss of strength would require actual steel temperatures, not air temperatures, of 650° C (1202° F).

2. **NIST NCSTAR 1-1A, WTC Investigation**, Chapter 2, page 34, paragraph 2.3.2.
http://wtc.nist.gov/NISTNCSTAR1-1A.pdf

3. **"Why Indeed Did the WTC Buildings Completely Collapse"** by Physics Professor Steven Jones
http://www.journalof911studies.com/volume/200609/WhyIndeedDidtheWorldTradeCenterBuildingsCompletelyCollapse.pdf.

4. **Boeing Technical characteristics for the 707 and 767 aircraft**. See 707-320B and 767-200ER.
http://www.boeing.com/commercial/707family/product.html
http://en.boeing-me.com/ViewContent.do?id=2404

5. **Executive Summary of the Final Report of the National Construction Safety Team on the Collapses of the World Trade Center Towers**, extracted from NIST NCSTAR 1.
http://wtc.nist.gov/pubs/NCSTAR1ExecutiveSummary.pdf

6. **Final Reports of the Federal Building and Fire Investigation of the World Trade Center Disaster** http://wtc.nist.gov/reports_october05.htm

7. **Manual of Steel Construction**, 8th edition 1980, printed by the American Institute of Steel Construction Inc.

8. **Examples of microstructure of steel which has been heated and cooled**. At bottom of page.
http://wtc.nist.gov/media/gallery.htm#sim

9. **NIST photos of fire experiment setups**. See uninsulated truss setup in next to last picture at bottom.
   http://wtc.nist.gov/media/gallery2.htm

10. "**Sudden Collapse Initiation was Impossible**" by Dr. Frank Legge and Tony Szamboti, Dec. 2007
    http://www.journalof911studies.com/volume/200703/Sudden_collapse_initiation_impossible.pdf

11. **NIST SAP2000 central core column cross sectional area data**
    http://wtcmodel.wikidot.com/nist-core-column-data

12. **"Analysis of Mass and Potential Energy of World Trade Center Tower 1"** by Gregory Urich,
    Dec. 2007 http://www.journalof911studies.com/volume/200703/GUrich/MassAndPeWtc.pdf

13. **Photo of the aircraft impact damage to the exterior of the North Tower**

Floors

The aircraft impacted both towers at angles to the horizontal on their faces. Here the impact damage to the North Tower is shown exhibiting the angular penetration to the building face. In this case, the wings would have had contact with at least five 4.35 inch thick reinforced concrete floors, in an edge on fashion, after going through the perimeter columns. The vertical portion of the tail would have also had a similar situation due to its height. Note how no full tail imprint is seen and it appears that the tail did not penetrate much past the perimeter.

14. **Graphic of central core column spacing vs. fuselage and central engine diameters**

Wings, engine fan assemblies, and the tail would have been shredded after going through perimeter columns and multiple floors edge on, leaving only parts of the fuselage, landing gear, and 4 foot diameter center portions of engines, with greatly diminished energies, having any chance of causing damage to the Central Core

4 foot dia. central portion of engine

Relative size of 16.5 ft. dia. fuselage

North Tower aircraft approximate orientation to the central core

Central Core

Perimeter Columns

87 feet

209 feet

137 feet

209 feet

South Tower aircraft approximate orientation to the central core with fuselage and central portion of engine shown in relative sizes
'