

Controversy About the Uplifted Second-Floor Slab at the Pentagon: Identifying a Likely Source of Upward Mechanical Impact

By Wayne Coste

As part of the long running controversy about what happened at the Pentagon on 9/11, the curious damage to a portion of the second-floor slab has sustained many wide-ranging speculations. The reason for these speculations is that the mechanical damage from the impacting aircraft largely was contained between the first and second-floor slabs and the destructive momentum was, effectively, only horizontal. The source of a significant vertical mechanical force powerful enough to snap and uplift a portion of the second-floor slab has not been previously identified. An exhibit about the Pentagon at the 9/11 Memorial Museum in New York City provides one explanation—that of an exploding fuel tank beneath it. However, a survivor from the immediate vicinity of the alleged explosion does not recount any such explosion, let alone one powerful enough to snap that slab into two pieces. In this paper, an explanation for the vertical mechanical force will be presented that is based on the gyroscopic properties of the rotating engines.

The Uplifted Slab

The uplifted second-floor slab is the most prominent evidence for a powerful vertical force originating from within the first floor. The sharpness of the break and “tenting” shown in Figure 1 clearly suggests a mechanical origin rather than the fracturing and crumbling of concrete that a pressure-wave blast from below would have created.



Figure 1: Uplifted slab is cleanly split along a single straight crack¹.

¹ Pentagon Work, FBI – Federal Bureau of Investigation, <https://youtu.be/pyBMUSPpIP8?si=3XB07AgKk5opnRjn&t=1500>

Precession: The Vertical Redirection of Horizontal Mechanical Forces

The source of the vertical mechanical force has eluded analysts investigating the Pentagon for over two decades. Additionally, a related question that has been asked frequently is “what happened to the engines, they should have continued through the Pentagon like a multi-ton battering ram.” The answer to these questions requires an understanding of the dynamics of rotating engines.

The engines were rotating at up to 40,000 revolutions per minute at time of impact and therefore had significant rotational inertia. Due to gyroscopic effects, this rotation would change a “multi-ton battering ram” with horizontal linear momentum into a tumbling and bouncing mass wreaking pandemonium. This mass would be capable of exerting large vertical forces capable of snapping the second-floor slab in two. Additionally, this violent, chaotic motion would have most likely fractured and dissembled the engines into smaller component pieces rather than leaving the engines intact to continue through the first-floor space like a battering ram. Figure 2 shows the gyroscopic concept of precession² where a horizontal torque applied from the right will not create a horizontal acceleration to the left, but rather it would tend to reorient the engine in a vertical direction.

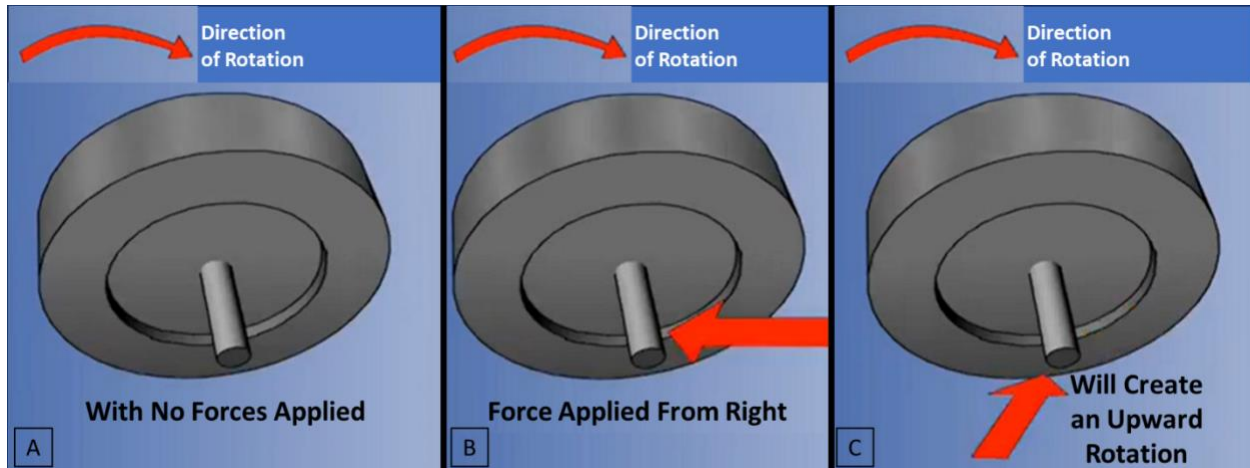


Figure 2: The effect of a force from the right on a rotating engine moving forward (B) would create a vertical force(C).

In the case of the impacting 757’s rotating left engine, the engine would have initially been bolted to the left wing and would have experienced significant horizontal forces that would have created vertical forces. A multi-ton engine spinning with a high-speed rotation would have created powerful vertical forces.

Location of the Uplifted Slab

The uplifted slab is located inside the D-Ring of the Pentagon, approximately 100 feet from the exterior façade where the damage trail from the impacting aircraft begins. Figure 3 shows the location of the uplifted slab as a tan rectangle. In terms of column-based coordinates, the location is bounded by columns E5, E7, G7 and G5.

²Gyroscopic Theory | Gyroscope and Gyroscopic Working Principles | Lecture 25,

<https://youtu.be/JtniROSrovs?si=BBHJYB1NEv9gOuxJ> and/or

Gyroscopic Precession -- An Intuitive Explanation, TheHue's SciTech, <https://www.youtube.com/watch?v=n5bKzBZ7XuM>

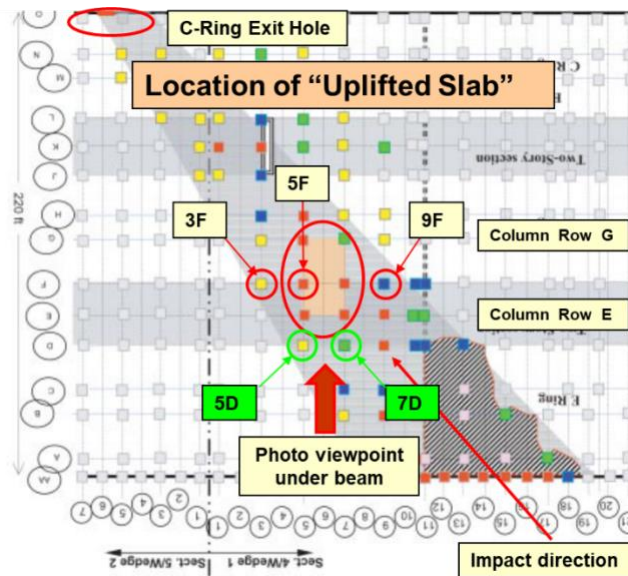


Figure 3: Location of the uplifted second floor slab along the impact path.

A photographic record of the area underneath the uplifted slab is shown in Figure 4. Several columns are identified to clarify their locations to facilitate comparisons in Figure 3. While this photo was taken during the clean-up, there are no signs of a significant detonation capable of snapping and uplifting a small, localized area of the second-floor concrete slab.

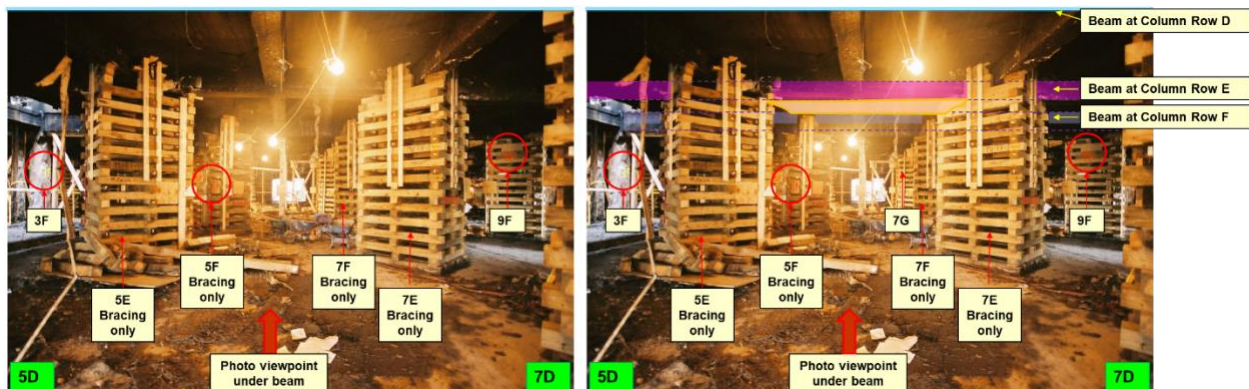


Figure 4: View of the area under the uplifted slab during clean-up³. Right side highlights beams and ceiling area from column rows E to F.

Survivor In the Vicinity of the Uplifted Slab

Major David King was in room 1D518 which is believed to be nearly adjacent to 1E517 where April Gallop was stationed at the time of impact. The location of King’s office is shown as a red square in both Figure 5 and Figure

³ [https://commons.wikimedia.org/wiki/File:FEMA - 4934 - Photograph by Jocelyn Augustino taken on 09-21-2001 in Virginia.jpg](https://commons.wikimedia.org/wiki/File:FEMA_-_4934_-_Photograph_by_Jocelyn_Augustino_taken_on_09-21-2001_in_Virginia.jpg)

6 and was near the area under the uplifted slab. A blast with enough force to snap and uplift a concrete slab would have been a very noticeable event to anyone in the vicinity. King did not recount an explosion⁴.

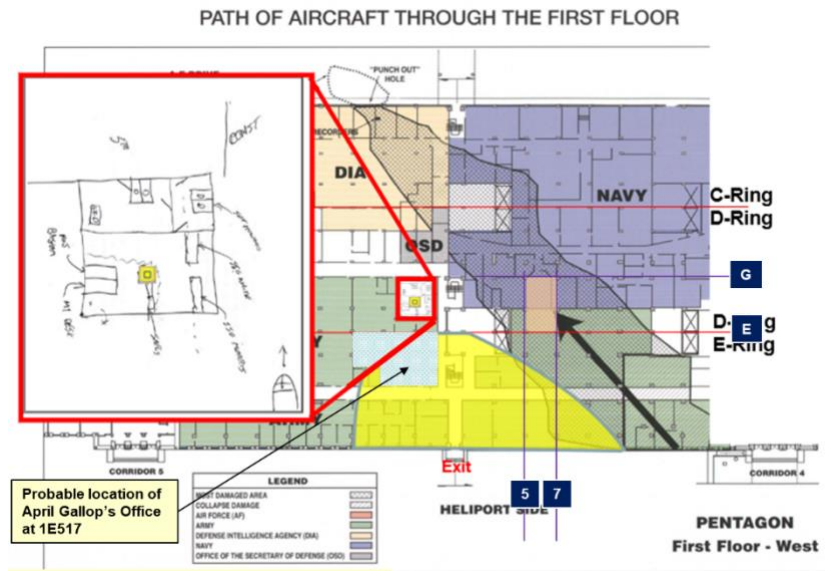


Figure 5: Best guess location of Maj David King in relation to the uplifted slab⁵ on the Floor Plan using the Arlington After Action Report⁶.

⁴ Coste, Wayne, Peer Review of Barbara Honegger's Parallels Between the WTC and Pentagon Evidence and Why It Matters, <https://youtu.be/7nxdThV4egA?si=IsGY-FisNJ8C4ibB&t=1914>

⁵ Stephen J. Lofgren . Then Came the Fire, https://history.army.mil/html/books/070/70-119-1/CMH_Pub_70-119-1.pdf

⁶ Arlington County After-Action Report on the Response to the September 11 Terrorist Attack on the Pentagon, https://permanent.fdlp.gov/lps21127/after_report.pdf

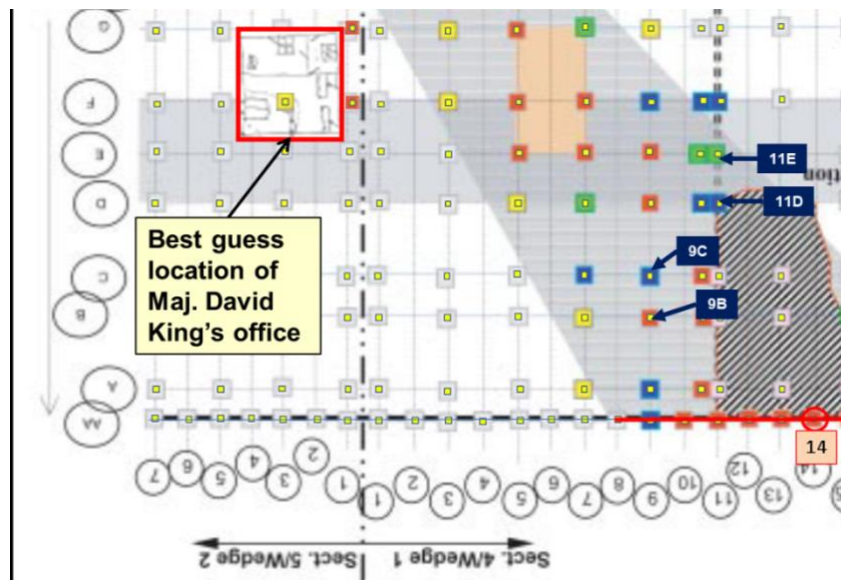


Figure 6: Best guess location of Maj David King's office using the ASCE Building Performance Report⁷.

The following is a portion of an interview given by Maj. David J. King Jr. to the Center for Military History:

MAJ. KING: ... I was in 1 Delta 518 ... When the plane struck, the entire wall behind me that goes into the E-Ring was knocked askew... What I did notice, the whole office erupting in flame ... I don't remember a large noise. I do remember thinking, "Why is my head not ringing and why is all this—why is this place in rubble?" You know, I was thinking of a truck bomb.

CAPT. DOVER: Describe what you heard. What did you hear?

MAJ. KING: I don't remember hearing a crash. All I just remember is the whole place erupting in flames. I don't remember a large crash or anything. And that was—I remember standing there: "Why isn't my head ringing?" Because an explosion would definitely ring my bell [e.g., a ringing in the head is a frequent phenomenon for those in the vicinity of an explosive detonation] ...

Explanation from a Display at the 9/11 Memorial Museum

Figure 7 shows a floor plan for the second-floor of the Pentagon that was on display at the 9/11 Memorial Museum. The vicinity of the uplifted slab is shown by a blue/white hash-marked area and the legend for this region says "Fuel Tank Explosion." Given the lack of any other explanation, this seems to be a best-guess explanation even though there are contraindications; the impossibility of an explosive mixture of jet fuel 100 feet into the building (jet fuel is formulated to be flammable, but non-explosive) and David King's survivor's story.

⁷ Mlakar, Paul E., et al. "The Pentagon building performance report." American Society of Civil Engineers, 2003, <https://web.archive.org/web/20171116010616/https://attivissimo.net/9-11/PentagonBuildingPerformanceReport.pdf>

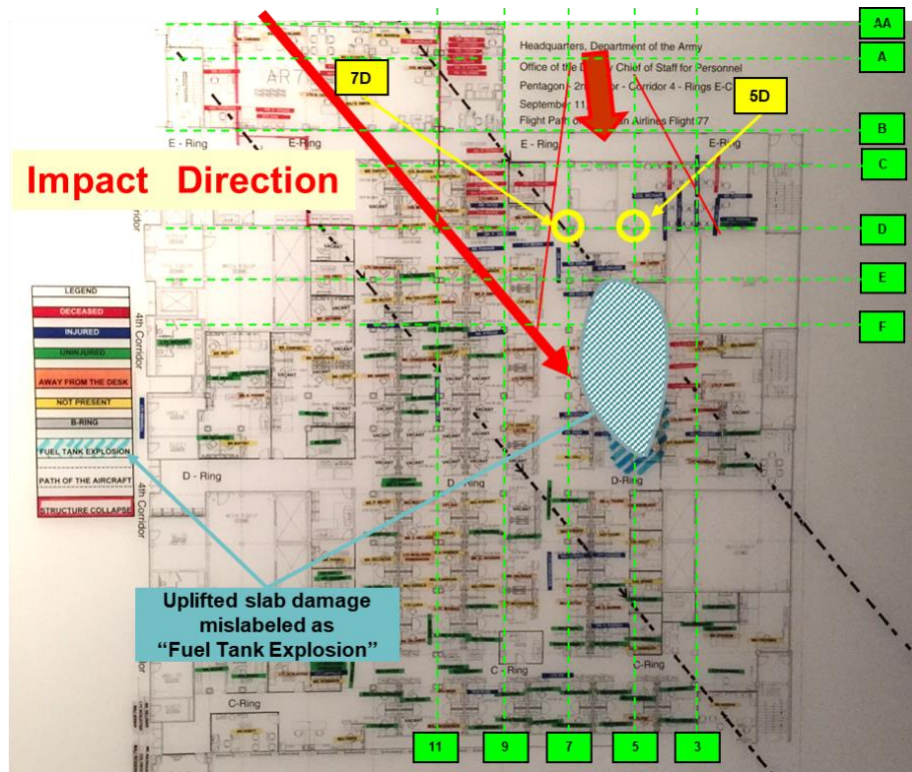


Figure 7: Floor plan in 9/11 Memorial Museum exhibit identifies the uplifted slab as a result of an exploding fuel tank.

Trajectory of the Left Engine

The physics of the impacting aircraft and evaluation of the damage has been discussed in various papers and videos⁸. As shown in Figure 8, the damage to the diesel generator trailer establishes the height and path of the right engine. Additionally, a notch that was gouged into a concrete retaining wall establishes the location and height of the left engine. This paper will focus on the trajectory of the left engine.

⁸ <https://911speakout.org/wayne-coste/>

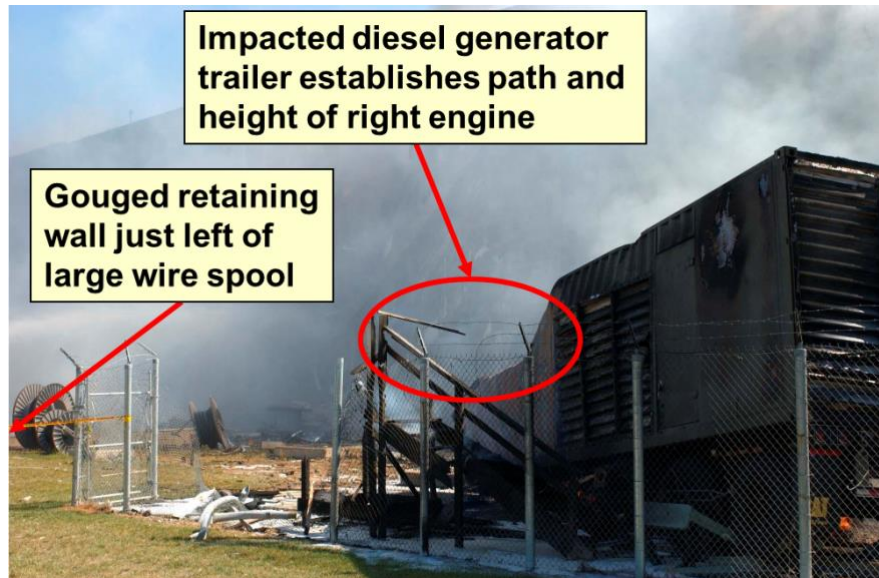


Figure 8: Impact of right engine onto diesel generator trailer and left engine into gouged retaining wall establishes path and heights.

Figure 9 shows an approaching plane with the dimension of a Boeing 757 as well as the diesel generator trailer and the gouged retaining wall.

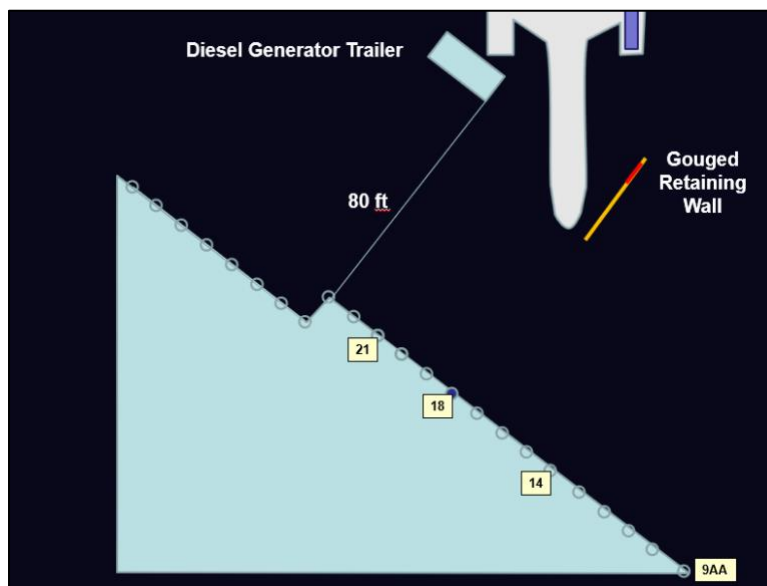


Figure 9: Right engine of plane impacts diesel generator trailer to begin yaw rotation. Left engine and gouged retaining wall highlighted.

Once the right engine impacts the diesel generator trailer, the plane began a yaw rotation (around its z-axis). The sequential forward motion of the left engine is shown as a series of discrete steps in Figure 10. A red line

traces the location of the left engine through the retaining wall and into the building at an angle of about 56 degrees instead of 52 degrees for the plane's center of mass.

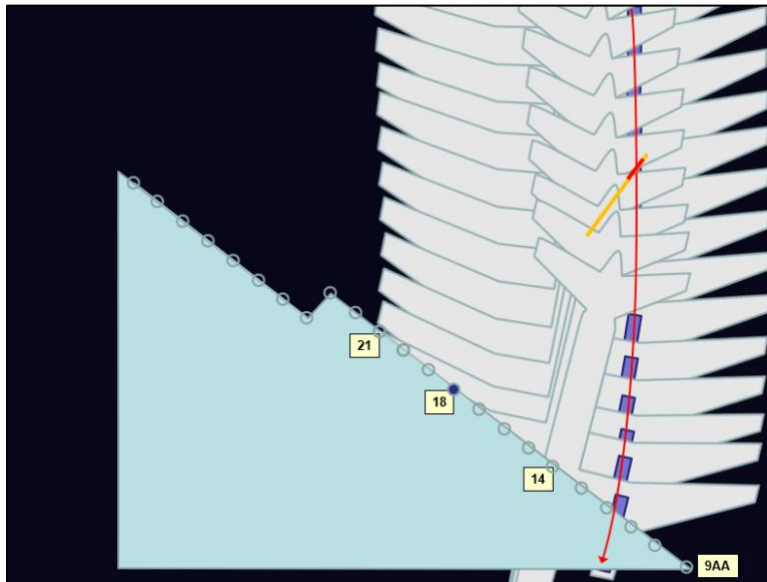


Figure 10: Trajectory of the impacting plane with yaw rotation. Angle of left engine impact is changed significantly.

Figure 11 shows the tail impacting between columns 11 and 12 because of the yaw rotation which validates the change in impact angle for the engine. Because the entire left wing was well below the second-floor slab upon impact, the tail's impact accounts for the destruction of the concrete beam and in-fill bricks below the windows in this area.



Figure 11: Yaw rotation causes tail section to impact between columns 11 and 12

Figure 12 and Figure 13 show the gouged retaining wall from different perspectives. Figure 14 shows three images and dotted lines showing the approximate path of the left engine into the Pentagon façade.

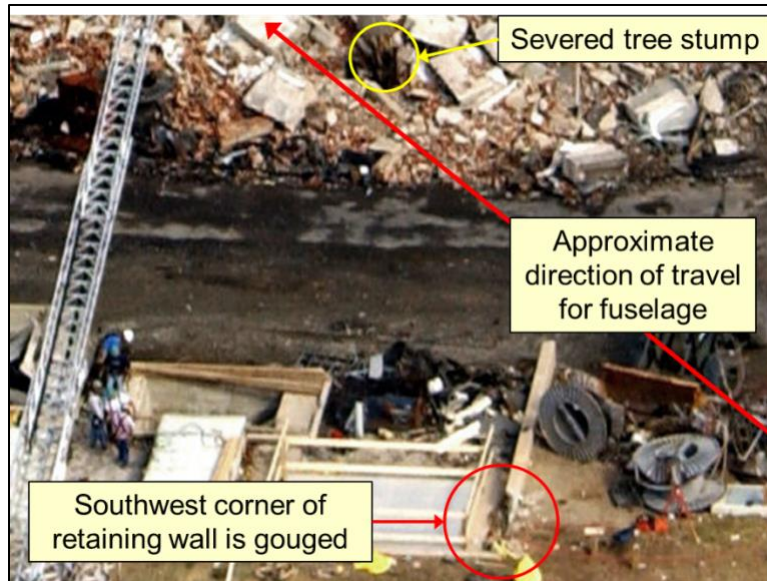


Figure 12: Gouged retaining wall as seen during the clean-up



Figure 13: Gouged retaining wall

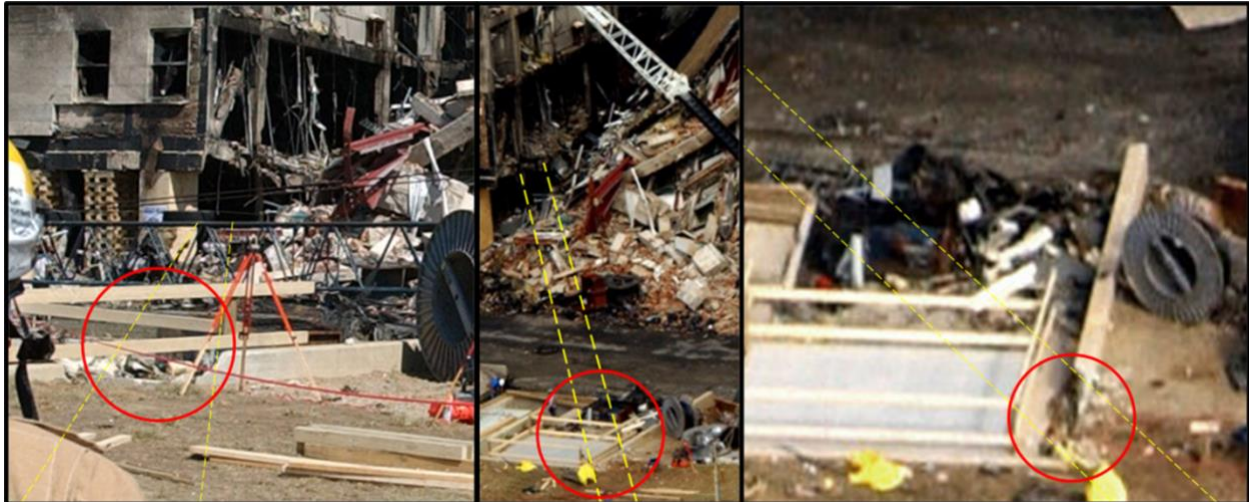


Figure 14: Composite images of gouged (or milled) retaining wall. Dotted lines should be redrawn to show effect of yaw rotation.

Once the engine impacts and gouges the retaining wall, there is no other evidence for the path of the engine until its apparent impact with columns 9B and 9C.

With the implied height at the left engine roughly established by the gouge, Figure 15 illustrates the height of the left engine inside the Pentagon by aligning the left wing with the maximum indent in the bent-and-bowed column 9AA as well as the fuselage impacting the lower three feet of column 14AA on the second-floor. At this height, the left engine will be inches above the floor and will impact column 9B – leaving its unmistakable impression in the form of an arc that was bashed into the column’s steel-reinforced concrete.

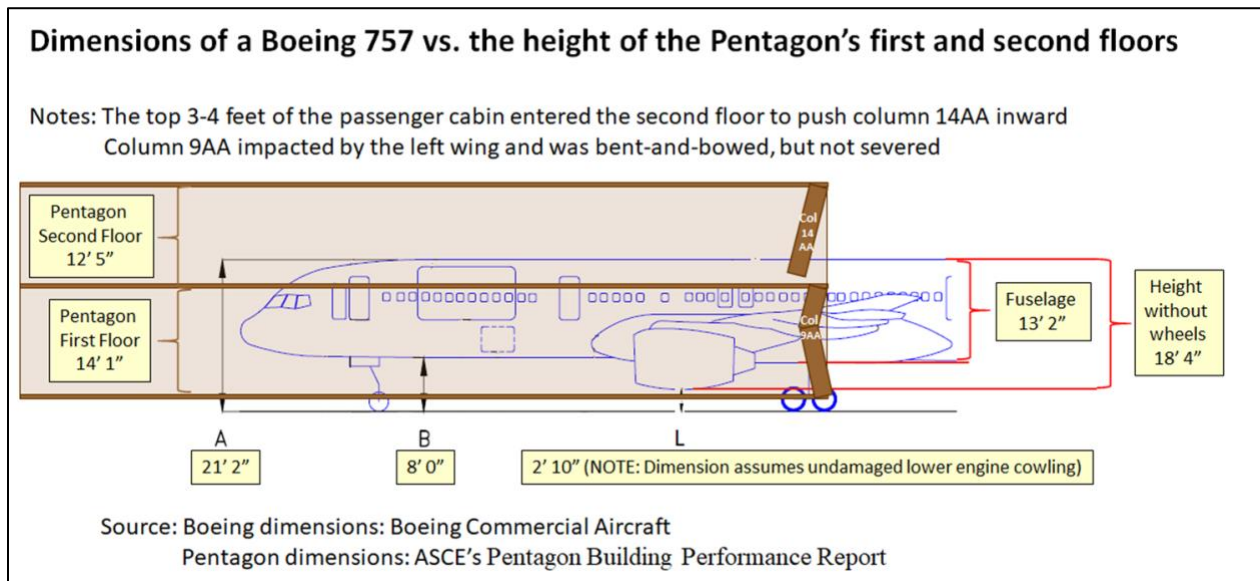


Figure 15: Dimension of a Boeing 757 aligned with impact damage at column 9AA and Column 14AA

Figure 16 traces the trajectory of the left engine inside of the first floor as it impacts column 9B, 9C and potentially other columns. From the damage to the right side of column 9B in association with damage to other columns, it is assumed that the engine was deflected to an angle of about 62 degrees and this horizontal force imparted the gyroscopic vertical rotation. With this change in direction, the engine would miss column 7D. This

would place the engine directly under the uplifted slab with a tumble and bounce motion that would create the upward force to snap and uplift the slab.

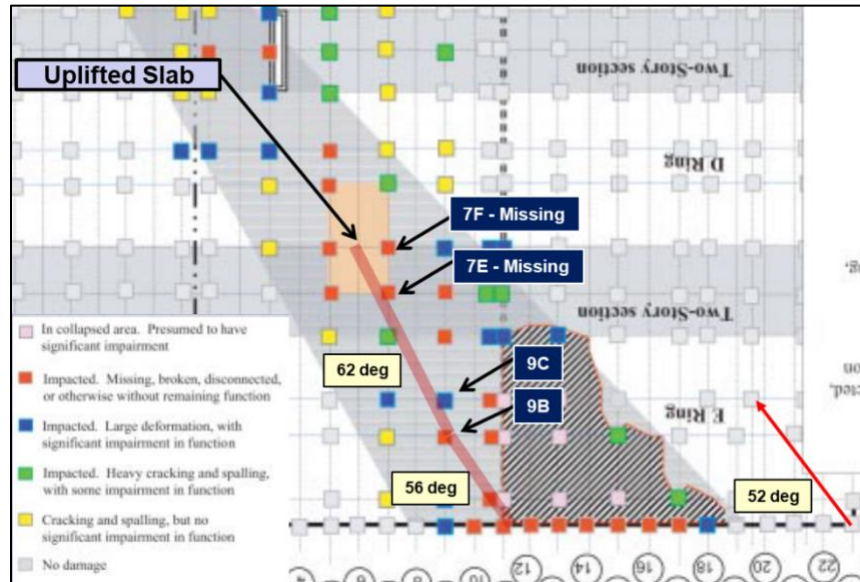


Figure 16: Path through the Pentagon from facade to uplifted slab

Column 9B and 9C are shown in Figure 17. They are both impacted and bent in the direction of the impacting aircraft.

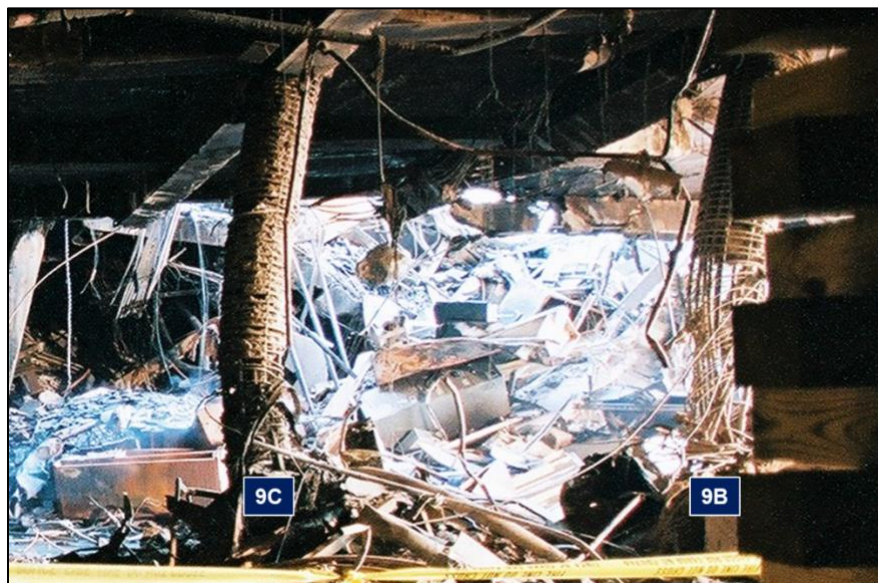


Figure 17: Columns 9B and 9C⁹

⁹ [https://commons.wikimedia.org/wiki/Category:The_Pentagon_on_13_September,_2001#/media/File:FEMA - 4436 - Photograph by Jocelyn Augustino taken on 09-13-2001 in Virginia.jpg](https://commons.wikimedia.org/wiki/Category:The_Pentagon_on_13_September,_2001#/media/File:FEMA_-_4436_-_Photograph_by_Jocelyn_Augustino_taken_on_09-13-2001_in_Virginia.jpg)

Figure 18 shows damage consistent with a large roundish object approximately 6 feet in diameter passing by and impacting. This circular impact damage is highlighted by a red arc.

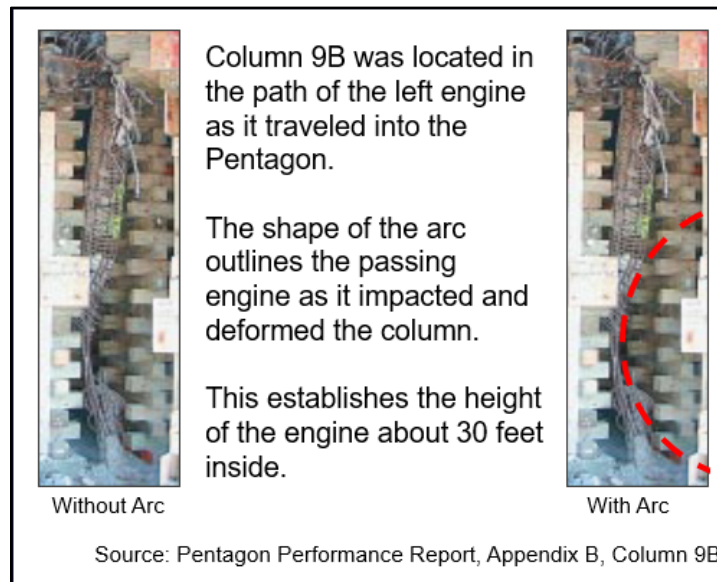


Figure 18: Column 9B as shown in the Pentagon Building Performance Report.

Figure 19 and Figure 20 show the damage to column 9C in the context of the overall damage where the columns are bent and bowed.

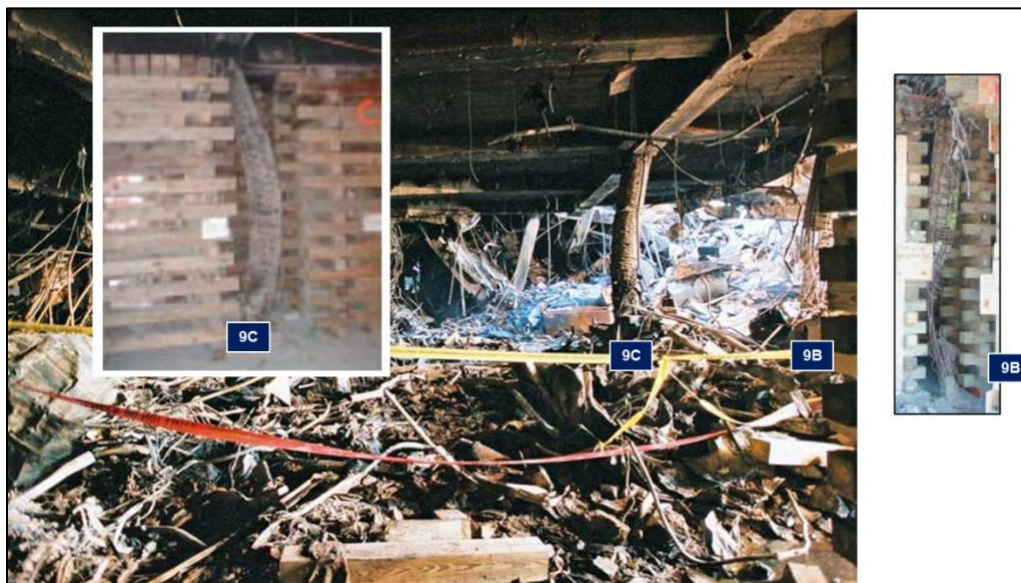


Figure 19: Columns 9B and 9C shown in context of other damage.

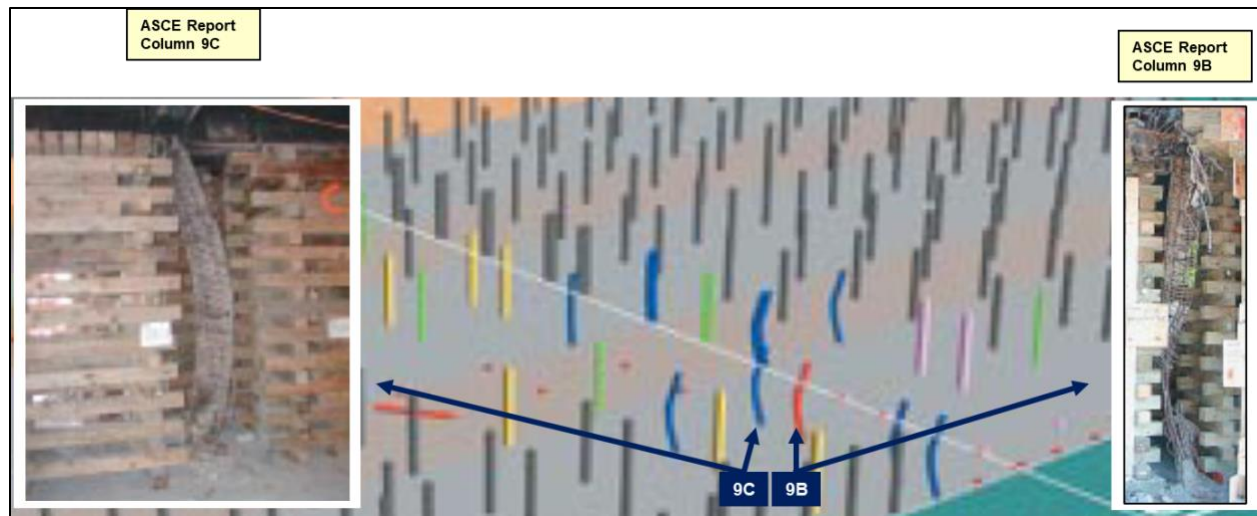


Figure 20: Locations of Columns 9B and 9C

Conclusion

The controversy over the uplifted second floor slab has led many to jump to the conclusion that explosive detonations were present. However, an explanation that is consistent with the physics of simple mechanical motions has herein been developed to explain the peculiar snapping and “tenting” of this slab.