

g-Force and the Pentagon Plane

By David Chandler

The leadership of Pilots for 9/11 Truth (PFT) has insisted that a Boeing 757 could not have hit the Pentagon because it would experience a severe “g-force” while pulling out of a dive to be able to hit the Pentagon without crashing into the lawn. Before reaching the Pentagon the plane would have to clear the Virginia Department of Transportation (VDOT) communication tower, then descend to hit the first light pole, then level out to impact the Pentagon itself. PFT calculated that the pull-up maneuver would subject the plane to a g-force of 10.14 g. This claim has long been featured on the PFT web site (<http://www.pilotsfor911truth.org>), and it remains there today in an embedded video entitled “G-Forces--Scene from 9/11: Attack on the Pentagon.”

As far back as 2011, the late Dr. Frank Legge did a detailed analysis of the PFT g-force calculation, and supplemented it with his own detailed calculations which he made available as a spreadsheet file, http://911blogger.com/sites/911blogger.com/files/G-force_calculator_Pilots7.xls, which he communicated to PFT. His letter to PFT director Rob Balsamo is posted on his website, <http://scienceof911.com.au/pentagon/rebuttal>, which I now maintain as an archival site, and is mirrored on my website <http://911speakout.org/response-to-rob-balsamo-fl>. Dr. Legge pointed out errors in the calculation and showed that needlessly restrictive assumptions were made which artificially amplify the result beyond reason. The video mentioned above purports to answer the critiques (without identifying the critics) but persists in using the unreasonable assumptions and concludes with the same erroneous result: 10.14 g.

I worked closely with Dr. Legge over the past few years and did an independent computation of the g-force using two different approaches: one which models the path as a circular arc, and the other which models it as a parabolic arc. There is no significant difference in the results from the two models. Since the PFT computation uses a circular arc approximation I will present my circular arc computation here.

Dr. Legge and PFT are in rough agreement on the basic measurements of three points: the top of the VDOT tower, which the plane was able to clear, the location of the impact on the first light pole, and the location of the impact point on the Pentagon. For each of these there is the altitude above sea level for the base of the feature and the height of the feature itself. The calculation here is based on Rob Balsamo's numbers. The three points, measured in feet can be expressed as

	VDOT Antenna	First Light Pole	Pentagon Impact
Horizontal distance from impact point	3416 ft	1016 ft	0
Altitude of base	135 ft	40 ft	33 ft
Height above base	169 ft	40 ft	12 ft

Net coordinates (-3416, 304) (-1016, 80) (0, 45)
 (Viewing event left to right)

Here is a plot, to scale, of these features with a circular arc passing through these three points.

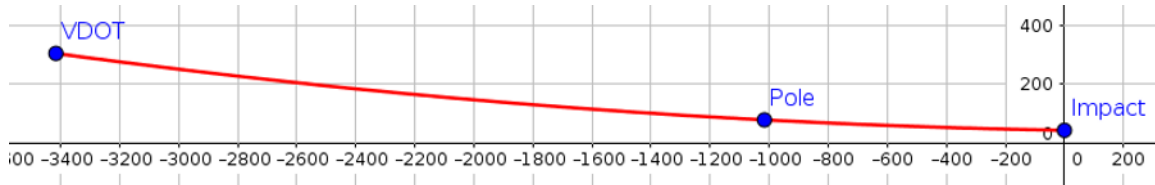


Figure 1

The radius of the arc for this trajectory is 29,233 ft. The centripetal acceleration for a circular path with speed v is given by $a_c = \frac{v^2}{r}$. Using PFT's value for the speed (781 ft/s = 532.5 mi/hr),

$a_c = 20.87 \text{ ft/s}^2 = 0.648 g$. To this we must add 1 g , which is the g -force when flying level, for a total of 1.648 g .

PFT chooses a path whose radius of curvature is 2085 ft, an extremely small radius, without explaining clearly how that radius is determined. This value is equivalent to assuming a straight path from the VDOT tower to the first light pole, then a hard pull-up where the plane levels out within less than 200 feet. I thought this might be their reasoning because they repeatedly state in their video that the flight across the lawn was level. The problem with this calculation is the path does not extend low enough. It would level out about 26 feet higher than the impact point. The other possibility is that if they chose a center of curvature that allows the path to reach the level of the impact hole there would be a discontinuity in the slope transitioning from the incoming path. After playing with these possibilities, trying to give their method the benefit of the doubt, I am forced to agree with Dr. Legge's original assessment that the PFT value of the radius of curvature is either an error in computation, an error in reasoning, or both.

Dr. Legge's alternate construction, trying to come as close as possible to PFT's assumptions, was to allow for a straight line approach from the VDOT tower to the first light pole. The straight incoming path would then transition smoothly to a circular arc that would take the plane to the impact point. In this scenario the pull-up and therefore the added g -force, would take place over the width of the lawn. The radius of curvature for this scenario is 8675 ft, which would produce $a_c = 70.31 \text{ ft/s}^2 = 2.18 g$. The total g -force would therefore be 3.18 g which though beyond the design specs, may be borderline survivable.

This shorter pull-up distance has little to recommend it, however. Figure 2 shows the two paths superimposed.

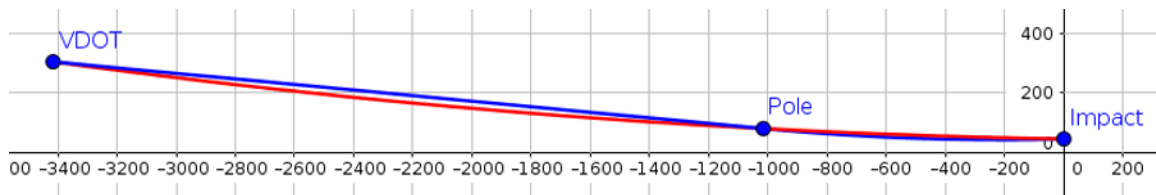


Figure 2

The only thing I could see in the PFT presentation that seemed to drive their calculation toward a short pull-up duration was the repeated assertion that the plane flew level over the lawn. The problem is there is no basis for this claim other than in a very approximate sense. As Figure 2 shows, the two paths are both relatively level and barely distinguishable from each other. Note also that the lawn itself is not level. It slopes toward the Pentagon. The photographs of the plane crossing the lawn, taken by the security cameras, suffer from severe barrel distortion, so interpreting them quantitatively is difficult. To find the actual path we would need to examine the last frames of the FDR, but PFT denies the usefulness of that data. The newly decoded FDR file shows that the plane started to pull up before pole 1. The maximum force recorded briefly in the FDR file is 2.26g, safely below the design maximum for the plane.

We should remind ourselves that the purpose here is not to determine the actual path of the plane but to see whether there is a feasible path. PFT asserts that the only feasible path would subject the plane to a g-force of 10.14 g. Dr. Legge and I have shown that a number of feasible paths exist with much lower g-force implications, so g-force cannot be used to rule out the impact of a large plane at the Pentagon.

Dr. Legge's original calculations were carried out on a spreadsheet together with an online utility that allowed him to fit a circle to three data points. He goes through more scenarios in detail. My calculations, which are intended to convey the gist of Dr. Legge's calculations, were carried out with the aid of a geometry tool called GeoGebra, obtainable as a free download from <http://geogebra.org>. This tool carries out precise algebraic calculations in the background to match geometric constructions in the "geometry view." I made the reasonable assumption that the slope must be continuous across all transitions: no sharp corners in the path. My suspicion is that PFT's calculation error consists in a failure to satisfy this condition, but I would welcome clarification from PFT as to exactly how they arrived at the small radius of curvature of their path, and their justification for requiring such a short duration of the pull-up maneuver. Since this apparent error has gone unaddressed on the PFT website for over 5 years and since others who are less able to do the calculations for themselves rely on the experts in the movement (scientists, engineers, architects, pilots) for the appropriate mathematical/scientific analysis, it is important that this problem be fully addressed and rectified.