Roswell Trajectory Feasibility

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Much controversy has raged over the question of where, exactly, the Roswell object crashed in July of 1947. While witness testimony has firmly established the location of what has come to be known as the Debris Field below Corona, New Mexico, in Lincoln County, the impact site itself has remained elusive.

By all accounts, the Roswell UFO underwent some sort of disabling trauma (possibly a midair lightning strike) over the Debris Field, scattering its debris over many acres of prairie and falling to earth somewhere down country. The real question, when one takes the Debris Field as the starting point for analysis, is then how far downrange is the object likely to have fallen?

For purposes of this analysis I will make the simplifying assumption that the object lost its own propulsion, becoming a "dead" missile plunging through the air, from the moment of operational trouble, over the Debris Field. We don't know for sure, of course, whether or not the craft really did entirely lose propulsion; however, since a craft under its own propulsion could conceivably have flown almost any distance before crashing, one needs to make the "loss of propulsion" supposition in order to establish, even approximately, a minimal downrange drop distance.

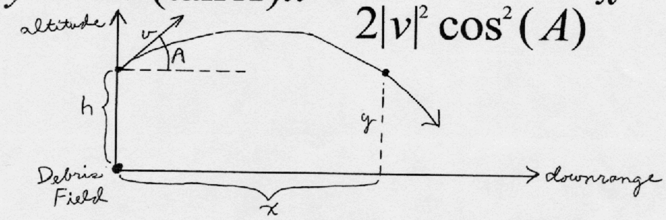
Here we are aided by basic principles from mathematics and physics. An object suddenly losing propulsion would be essentially like a ball fired from a cannon and allowed to follow a gravitationally determined parabolic trajectory to a point of impact downrange, and there is a standard equation describing such motion, as shown in Figure 1.

Basically, in the mathematical model shown there, there are three variables: (1) the height of the object at the time it got into trouble over the debris field, (2) the velocity of the object at that same time, and (3) the distance downrange it could have dropped, under the assumption of lost propulsion. My purpose here is to examine the question of what happens to one of these variables—in particular, the drop-distance downrange—if one makes assumptions about the other two variables. When I say, "makes assumptions," I mean to suggest not that one makes assumptions about what the facts or conditions absolutely were, on that night in July 1947, but rather one makes working suppositions for the purpose of seeing what conclusions would then follow, in various such hypothetical scenarios.

This is a more valuable activity than one might suppose, for at least two reasons. First, one can get a sense, in the abstract, of what combinations of factors are feasible and what combinations are not; it becomes clear, for example, that under some assumptions about altitude and velocity, excessively long drop-distances are not feasible if the object lost propulsion, and one can be fairly specific about this. Second, one can look at these combinations of assumptions in the light of witness accounts. For example, any scenario in which we must assume a tremendously high altitude may well be inconsistent with ground sightings as reported by the witnesses to the event.

For h = initial altitude, A = angle of elevation, |v| = magnitude of initial velocity, x = distance downrange at any given time, and y = altitude at any given time, with g the gravitational acceleration constant in units consistent with the variables,

$$y = h + (\tan A)x - \frac{g}{2|v|^2 \cos^2(A)} x^2$$



For A = 0, so that tan(A) = 0 and cos(A) = 1, and for g = 32 ft/sec^2, and for y = 0 at impact, the equation of motion simplifies to

$$0 = h - \frac{16}{|v|^2} x^2 \text{, which implies } \quad x = \frac{|v|\sqrt{h}}{4}.$$

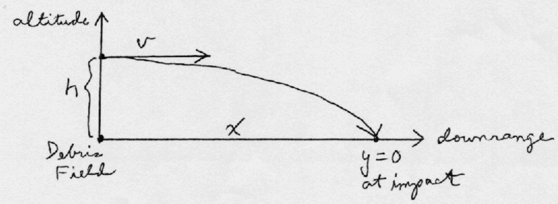


Figure 1

Let us see, then, what happens when we examine how the pertinent variables are interrelated. If we denote the UFO altitude over the Debris Field as h (measured in feet), the magnitude of the UFO's velocity at the time of trauma as v (in feet per second), the ground-distance downrange at any given moment as x (in feet), and the altitude at any given post-trauma moment as y (in feet), then with y = 0 at the time of impact with the earth, and with an angle of elevation A = 0 degrees (i.e., assuming essentially level flight over the Debris Field), the equation, in Figure 1, relating h and |v| and x, simplifies to x =|v|[sqrt(h)]/4, where "sqrt(h)" denotes the square root of h. Thus one may compute the drop distance x by multiplying the initial velocity by the square root of the initial altitude and dividing by 4. This mathematical model is somewhat basic (it wouldn't account for such things as drastic deflections due to strong winds, or the effects of gliding—which, however, generally requires wings), but the model is adequate to account for the fundamental aspects of motion, assuming the object after trauma to move only by the effects of forward momentum and gravity.

For example, if we fix the initial velocity as |v| =3,000 mi/hr (4,400 ft/sec), and if we fix the initial altitude as 6,400 feet, the projected drop distance downrange would be x =4400[sqrt(6400)]/4 =88,000 feet (16.7 miles).

It is clear from the equation that the greater the initial velocity |v| and the higher the initial altitude h, the longer the projected downrange distance x, very much in keeping with common sense. It follows that the greater a drop distance one wants to hypothesize from the Debris Field, assuming loss of propulsion, the greater initial velocity and/or the greater initial altitude one will need to assume.

If, for example, one wants to conclude that a "dead" object could fall 40 miles (211,200 feet) from the Debris Field if the initial velocity was (say) 3,000 mi/hr, we would need to assume an initial altitude of 36,864 feet. But the problem with this is that such an altitude would scarcely be consistent with known ground sightings, in that an object only a few feet across would probably not be easy to see at an altitude of nearly 37,000 feet.

On the other hand, if again one wants to envision a drop distance of 40 miles but at a low altitude this time, say h =6,400 feet, one would need to assume an initial velocity of 10,560 ft/sec =7,200 mi/hr. Such a velocity isn't inconceivable, but again there would be problems of consistency with ground sightings, since an object traveling that fast at this relatively low altitude would appear to move through 180 degrees of arc from horizon to horizon in approximately one second, not consistent with the sorts of reports witnesses have given.

Certain putative crash sites at distances of 35 to 40 miles out from the Debris Field have indeed been suggested, but my analysis shows that such sites are highly problematic, one may even say unlikely, unless one assumes either an initial velocity or an initial altitude of doubtful consistency with witness descriptions, or unless one declines to assume a loss of propulsion at the time of trauma. (Thus if genuine debris were ever recovered at such extended distances downrange, assuming reasonable initial velocity and altitude, one could infer that the craft probably did not completely lose its own propulsion.)

Returning to the assumption of propulsion loss, one may establish a "band of feasibility" for the downrange drop distance in keeping with any hypothetical interval of initial velocity values and any hypothetical interval of initial altitude values. For example, if we were to suppose that the initial velocity was between 2,400 miles/hr (3,520 ft/sec) and 3,600 miles/hr (5,280 ft/sec), and if we were at the same time to suppose that the initial altitude was between 5,000 feet and 7,000 feet, we could compute a "distance-out" range between 62,225 feet and 110,439 feet, i.e., between 11.8 and 20.9 miles. We may think of this interval as producing the band of feasibility shown in Figure 2.

An impact-site "band of feasibility"
based on hypothetical assumptions
2400 mph $< |\mathbf{v}| <$ 3600 mph,
5000 ft. $< h <$ 7000 ft.,
and initial loss of propulsion.

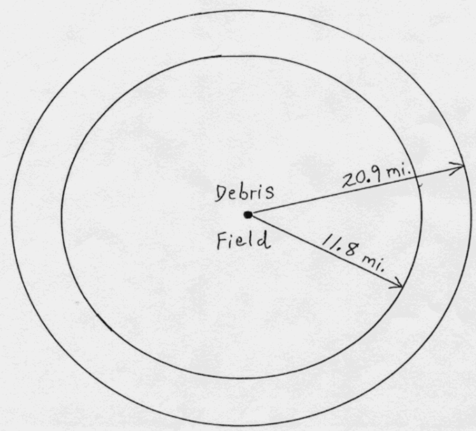


Figure 2

One should remember, of course, that such a particularized band of feasibility depends upon specific assumptions about velocity and altitude; change these assumptions, and the band of feasibility changes too, so that obviously one wants to make velocity and altitude assumptions as consistent as possible with such considerations as sighting reports and physical environment. For example, if the craft was struck by lightning, one should consider that this is far more likely to occur at (say) an altitude of 6,000 feet than an altitude of 36,000 feet. For another example, Jesse Marcel said that the debris was spread along a strip about 0.75 miles long, and if one were to estimate that the "trauma event" lasted one second, the notion of 0.75 miles of forward motion in one second would imply a velocity of 2,700 miles per hour. Therefore, if a one-second trauma event (e.g., explosion and scattering due to a lightning strike) is of reasonable duration, a velocity in the vicinity of 2,700 mi/hr would be more reasonable than a velocity, say, of 7,000 mi/hr. In this manner one may explore, at length, the relations between reasonable assumptions and reasonable conclusions.

I would claim that such mathematical considerations as trajectory feasibility can materially assist in solving the problem of how to narrow down possibilities on the UFO impact site, and can help clarify the nature of the whole event, in a manner in keeping not only with witness accounts but with physical realities as well. It is important that we keep these matters on a scientific footing, because under any particular set of initial conditions about things like velocity and altitude, some things are possible and some things are not. One can argue pro and con about a lot of things, but—at least within the limits of our understanding—physics is physics.