

One night while out spreading manure on his field, Jon Johnsson saw what he claimed was a large UFO flying over his potato field. The UFO appeared on the western horizon and then exploded overhead. The next morning, Johnsson went out in his crop duster and managed to locate two fragments of the UFO. One fragment was 4 km east and 5 km north of the field and looked to have a mass of about 500kg . A second fragment was about 2 km east and 5 km south of his field. This fragment seemed about twice as massive as the first (about 1000kg).

Johnsson called you up and asked for your help figuring out if there are more pieces out there. Specifically, since the UFO seemed to be traveling very quickly, he estimated 200m/s , Johnsson figured that one piece may have landed to the west of the field. Johnsson said that when it blew up, the UFO was about 500 m above the ground, which you calculated to mean that each of the pieces fell to the ground in about 10 seconds. (for sanity's sake, you're assuming that the explosion didn't have a vertical component, and you're also ignoring air resistance.)

1. Later in the afternoon when you tell your mom about the problem you're working on, she thinks about it for a minute and then says, "Well, at least one part of it is easy, the missing piece must be either due west or due east of the explosion." Is your mom right? What is she talking about?
2. After hauling the two pieces back to his barn, Johnsson called you up and said that the debris he found suggest that there's only one piece missing from the UFO, and that the missing piece is somewhere in the 500-1000 kg range in terms of mass. Johnsson wants to know where to look for the remaining piece. What's your advice? Be sure that your assumptions are clear