Journal of Physics Special Topics
An undergraduate physics journal

P2_5 Kinetic Impact Weapon Jabba

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November 7, 2022

Abstract

Within the Star Wars fictional universe, the Death Star was a battle station used by a government called the Galactic Empire and was designed to be able to destroy planets with a "super laser". For this paper, we considered a method to break apart the Death Star. Jabba the Hutt was a powerful gangster in the Star Wars universe and this paper looks into how the Death Star could have been broken apart by colliding a perfect sphere of multiple Jabba the Hutt characters with the Death Star. We found that the total number of Jabba the Hutt characters was 4.018×10^{25}.

Introduction

The Death Star was a battle station that was 120 km wide and contained systems that controlled its "super laser" as well as its power plant. This "super laser" was able to destroy an entire planet in the Star Wars universe [1]. Luke Skywalker was a Jedi Knight who used his own battle ship (an X-Wing Fighter) to impact the reactor core of the Death Star. This was done using what was known as "proton torpedos" in the Star Wars universe, which are described as "missiles of energy" [2]. Within the Star Wars universe, this was considered to be the only way to destroy the Death Star. For this paper, we used physical theories known in the real world to consider how the Death Star could have been broken apart. The character we used in this paper was Jabba the Hutt. Jabba the Hutt was a gangster known in the galaxy. He was 3.9 m tall, so alone, was much smaller than the Death Star [3]. In this paper, we considered how much energy a perfect sphere of multiple Jabba the Hutt characters (with no gaps in the sphere) would have if it were to be used as a weapon and break apart the stationary Death Star if it were to collide with it. From this calculation, we were able to find out how many Jabba the Hutt characters this perfect sphere would contain.

Jabba the Hutt as a Potential Weapon

Firstly, we calculated how much energy it would take to blow up the Death Star. To do this we used the equation for gravitational binding energy:

$$U = -\frac{3}{5}\frac{GM^2}{R}, \tag{1}$$

where G is the gravitational constant, M is the mass of the Death Star and R is the radius of the Death Star. We found that the Death Star's mass is 2.24×10^{23} kg [4]. Earlier, we stated that the Death Star was 120 km wide. By using this as the diameter of the Death Star, the radius of the Death Star was, therefore, equal to 60 km. By substituting these values into Equation 1, the amount of energy it would take to break apart the Death Star was 3.349×10^{31} J.

To calculate the amount of energy a perfect sphere of Jabba the Hutt characters with no gaps

within the sphere has, we calculated the energy that one Jabba the Hutt character would have when colliding with the Death Star using the equation:

$$KE = \frac{1}{2}mv^2, \tag{2}$$

where m is the mass of one Jabba the Hutt character and v is his velocity. We assumed that Jabba the Hutt is released from rest and that his velocity is 35 ms^{-1}. We used this velocity as this is the velocity of a blaster from an X-Wing Fighter [5]. The mass of one Jabba the Hutt is known to be 1361 kg [6]. Therefore, the energy that one Jabba the Hutt character would impact the Death Star with was 833600 J.

This energy is not greater than the energy that is needed to blow the Death Star up. Just like we hypothesised, multiple Jabba the Hutt characters are needed to have an energy that is greater than the energy needed to break apart the Death Star. We considered a sphere containing multiple Jabba the Hutt characters, where there are no gaps within the sphere and the number of Jabba the Hutt characters needed to provide enough energy to break apart the Death Star when colliding with it was calculated to be 4.018×10^{25}. This was calculated by dividing the amount of energy it would take to break apart the Death Star by the amount of energy that one Jabba the Hutt character would impact the Death Star with.

Conclusion

The purpose of this paper was to investigate how many Jabba the Hutt characters in one perfect sphere with no gaps was needed to break apart the Death Star in the Star Wars universe, as one Jabba the Hutt character would not have had enough energy to break apart the Death Star. If we were to consider how a sphere of multiple Jabba the Hutt characters were to be launched towards the Death Star, the number of Jabba the Hutt characters calculated is too large to be considered to be launched by an X-Wing Fighter. However, this paper looked into the physical aspects of the scenario and future research could look into how this many Jabba the Hutt characters can be launched towards the Death Star in this way.

References

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