Journal of Interdisciplinary Science Topics

Faster than Flintstone? – Could the Ant Hill Mob beat Fred for speed?

William Farmer
The Centre for Interdisciplinary Science, University of Leicester
19/04/2018

Abstract
This paper calculates the maximum velocity of the Ant Hill Mob from Wacky Races when employing their 'getaway' technique of running while carrying the car. It was found that the Mob were slower than Fred Flintstone, another character famous for powering his car with his feet, by a ratio of over 34 times.

Introduction

In the Hanna-Barbera cartoon Wacky Races, 11 teams compete against each other in a series of road rallies [1]. One such team is The Ant Hill Mob, a group of 7 1920's-esque gangsters [2]. The crew develop a method of increasing speed known as the 'getaway'; achieved by extending their feet out of the bottom of the car and powering the vehicle by foot, a technique notably similar to that of another famous Hanna-Barbera character, Fred Flintstone.

Figure 1 – The 'getaway' in action [3].

This article investigates the principles of human-powered transport, and determines a theoretical maximum speed for the Ant Hill Mob during the 'getaway'. This value will then be compared to Fred Flintstone's velocity (calculated elsewhere) to determine the fastest 'road-runner' in the Hanna-Barbera Universe.

The Car

The Ant Hill Mob's car, known as The Bullet-Proof Bomb (also The Roaring Plenty) appears to be based on a 1927 Packard 433 Series 6-Cylinder Touring Sedan, an example of which can be seen in Figure 2 [4].


Figure 2 – 1927 Packard 433 Series 6-Cylinder Touring Sedan [5].

This car has a mass of approximately 3,790 lbs (1,719.115 kg). The wheels are detailed of having width 0.0577 m and diameter 0.33 m (radius = 0.165 m) [6].

The Mob

As previously mentioned, the Ant Hill Mob consists of 7 members. An important fact when considering the velocity that could be generated is that they are all defined as dwarfs; someone 1.47 m or shorter [2, 7]. This corresponds to a mass between 38.5 – 46.7 kg [8]. It should be noted that when applying the 'getaway', only 6 members of the Mob start running while Clyde, the leader, continues to steer. This can be seen in figure 1.

Theory

The first step towards calculating maximum velocity of the Mob is calculating the rolling friction force to be overcome by the crew on running duty. This can be calculated as shown in equation 1.

$$F = \frac{Nb}{r} = \frac{mgb}{r}, \quad (1)$$

where m is the mass of the system, g is the force of gravity, b is the rolling coefficient of friction and r is the wheel radius.

The mass used is the combined mass of car and racers. Using the upper mass of a 1.47 m tall man to maximise power generated, each member of the Mob has a mass of 46.7 kg. Thus, the total mass of the system is shown in equation 2.

$$m = 1719.115 + 7(46.7) = 2046.0\ kg \quad (2)$$

The rallies in Wacky Races often appear to take place on abnormal road surfaces [1]. As such, the rolling coefficient of friction used is for car tires on loose worn gravel (0.04) rather than asphalt (0.02) [9]. The rolling coefficient is used as it is assumed the car is already moving at the time of the 'getaway'. Thus, by substituting in values into equation 1, a value for force can be generated.

$$F = \frac{2046.0 \times 9.81 \times 0.04}{0.165} = 4865.8\ N \quad (3)$$

Maximum velocity can then be calculated from this newly-calculated force and the power generated by the 'runners' using equation 4.

$$v = \frac{P}{F} = \frac{6(p)}{4865.8}, (4)$$

where P is the total power, p is the power of one runner and F is the frictional force.

The power of a single runner requires a power-to-weight ratio. Professional cyclists are capable of achieving up to 7.0 W kg^{-1} over a five-minute period, far longer than the period of time the Mob are ever seen running for [10]. In order to fully maximise the power generated, it is assumed the Mob will have similar power-to-weight ratios. Thus, one 46.7 kg runner will generate 326.9 W of power [8]. Equation 5 shows the calculation of maximum velocity.

$$v = \frac{6(326.9)}{4865.8} = \frac{1961.4}{4865.8} = 0.4\ m\ s^{-1} \quad (5)$$

Discussion

The maximum velocity of the Bullet-Proof Bomb is 0.4 ms^{-1}, or 0.89 mph. This is unlikely to be faster than the car's top speed, even if the Packard 433 only had 29.4 rated horsepower [6].

In comparison, in 2014 Friesen calculated the maximum velocity of Fred Flintstone to be 13.6 ms^{-1}, or 30.42 mph [11]. Clearly Flintstone is significantly faster. While the power generated by the Ant Hill Mob is significantly more than that of Flintstone, their combined mass is over 5 times that of Fred's foot-mobile. As the Mob are ranked in 3rd place after the completion of all 34 Wacky Races, with this difference in speed it is likely that Fred Flintstone would be a serious contender for a medal position should he have switched franchises [12].

Assumptions

In order to achieve a theoretical maximum velocity, a number of assumptions have been made. Firstly, it has been assumed that neither the car nor its occupants will produce any drag as the vehicle travels though the air. Secondly, it is assumed that the friction of the Mob's shoes on the ground does not at all slow down the vehicle.

In order to generate the maximum power possible, all members of the Ant Hill Mob are assumed to be the maximum height while still remaining a dwarf. It is also assumed that these men are in peak physical conditions, and can generate the same power-to-weight ratio as a professional cyclist over a sprint.

All of the above assumptions will be untrue in a real-life application, and so the attainable maximum velocity will be somewhat smaller than the theoretical value calculated here. Despite this, the initial aim of the paper what to find out the absolute maximum velocity that could be achieved, and so these assumptions seem fair.

Conclusion

Despite producing more power than Fred Flintstone, a greater mass, smaller rolling friction coefficient and shorter wheel radius means the Ant Hill Mob are over 34 times slower than the man from Bedrock [11]. Not only does he easily take the title of fastest 'road-runner', Fred would have a good chance at winning the Wacky Races were he to compete.

References

[1] Wacky Races Wiki (2018) *Wacky Races.* Available at: http://wackyraces.wikia.com/wiki/Wacky_Races [Accessed 9th March 2018]

[2] Hanna-Barbera Wiki (2018) *The Ant Hill Mob.* Available at: http://hanna-barbera.wikia.com/wiki/The_Ant_Hill_Mob [Accessed 9th March 2018]

[3] We The People Wiki (2018) *Wacky Races Vehicles.* Available at: https://www.wethepeoplewiki.com/wacky-races-vehicles/ [Accessed 9th March 2018]

[4] Hanna-Barbera Wiki (2018) *The Bulletproof Bomb.* Available at: http://hanna-barbera.wikia.com/wiki/Bulletproof_Bomb [Accessed 9th March 2018]

[5] GadgetFan97 (2018) *1927 Packard Six Touring Sedan. The possible basis for the Bulletproof Bomb.* Hanna-Barbera Wiki. Available at: http://hanna-barbera.wikia.com/wiki/Bulletproof_Bomb [Accessed 9th March 2018]

[6] Classic Car Database (2018) *1927 Packard 433 Series Touring Standard Specifications*. Available at: http://classiccardatabase.com/specs.php?series=2145&year=1927&model=17739 [Accessed 9th March 2018]

[7] Little People of America (2018) *Frequently Asked Questions*. Available at: http://www.lpaonline.org/faq- [Accessed 9th March 2018]

[8] Langtree, I. (2018). *Adult Male and Female Height to Weight Ratio Chart.* Disabled World. Available at: https://www.disabled-world.com/calculators-charts/height-weight.php [Accessed 9th March 2018]

[9] Engineering Toolbox (2008) *Rolling Resistance.* Available at: https://www.engineeringtoolbox.com/rolling-friction-resistance-d_1303.html [Accessed 9th March 2018]

[10] Hamilton, A. (2017) *Power to Weight Ratio: watts per kilogram explained and how to boost yours.* Cycling Weekly. Available at: http://www.cyclingweekly.com/fitness/training/the-importance-of-power-to-weight-and-how-to-improve-yours-164589 [Accessed 9th March 2018]

[11] Friesen, H.J. (2014). *Can you move a car the way Fred Flintstone does? Hal J. Friesen – science fiction & fantasy author.* Available at: http://halfriesen.com/can-you-move-a-car-the-way-fred-flintstone-does/ [Accessed 9th March 2018]

[12] Wacky Races Wiki (2018) *The Bullet-Proof Bomb.* Available at: http://wackyraces.wikia.com/wiki/The_Bullet-Proof_Bomb [Accessed 9th March 2018]