# uperman.jpgCalculating the solar efficiency of Superman

Superman's solar power actually contravenes the laws of physics, according to a team of students at the University of Leicester

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On his native planet of Krypton, Superman would have the strength of a human. His powers on Earth are down to two factors: one, the lower gravity on Earth compared to Krypton (think about the leaps and lifts a human could make on the moon compared to Earth); and energy collected from the rays of a young, yellow sun.

But just how much energy can be gleaned from solar power? Certainly, **according to physics students at the University of Leicester**, not enough to power Superman's feats. According to their research, the students -- Magdalena Szczykulska, Jason Watson, Lilian Garratt-Smithson, and Alistair William Muir --**determined that Superman's energy output** was 6,560 times greater than any energy he is able to draw from the sun.

Using the same equation used to calculate the efficiency of solar panels, the team divided the total amount of energy used when Superman is flying at an altitude of 30km by the total energy provided by the sun while he is in flight. According to this equation, the best solar panels in the world have an efficiency rate of 44.7 percent.

The team estimated the area of Superman's body in contact with the sun's rays during a day of flight, and calculated that he absorbs 1,096 joules per second. Then, they calculated how much energy he would expend to overcome drag forces. For an eight-hour flight, he would expend 207 billion joules.

$$Efficency=\frac{Usable Energy Out}{Usable Energy In}x100\%=\frac{207,000,000,000 J}{1,096\frac{J}{s}x3600\frac{s}{hr}x8hr}x100\%=656,000\%$$

"To put it into context, a normal solar cell would need to be twice the size of a football pitch to acquire the amount of energy Superman would use during flight," co-author Jason Watson said. "There are other ways that he could be getting his energy. As well as electromagnetic radiation, the sun emits neutrino particles. Millions of these pass through our bodies all the time. Maybe he is somehow able to use energy from the neutrinos -- but we don't know how he would do this."

There are a few things not taken into account in the study. First, when he first appeared in 1938, Superman was incapable of flight. He could leap 200 metres, lift a **car** over his head and deflect bullets -- the former two powers inspired by "John Carter of Mars" -- abilities gained from Earth's relatively low gravity. Flying, then, possibly wouldn't take up quite as much power as it would for a human. Secondly, he's Kryptonian. He could have all kinds of weird energy efficiencies going on in his body.