The Fundamental Values (G Force, Bungees)

Search only for what is the gforce of small airplane crash

AI Overview

The G-force in a small airplane crash typically ranges from **50 to well over 200 Gs**, depending heavily on the speed of impact and the distance over which the plane decelerates (e.g., stopping abruptly on a hard surface vs. sliding and crumpling through trees).

The Physics of Impact

Crash G-forces are not fixed; they are a function of how rapidly the aircraft loses speed. The physics formula for calculating average deceleration G-force is:

$$G\text{-force} = \frac{v^2}{2gs}$$

Where:

Survivability Thresholds

- **15 to 20 Gs:** Commercial aircraft seats and structures are often certified to protect occupants up to roughly 16 Gs in a forward-impact scenario.
- **50 to 75 Gs:** The NHTSA standard for a sudden impact acceleration causing severe injury or death to an average adult. hypertextbook
- **100+ Gs:** Forces frequently generated in high-speed impacts. These are usually fatal because the human body cannot withstand such abrupt deceleration. Quora +2

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G-Force Breakdown

- **Commercial Aircraft Limits:** Commercial airplanes are typically designed to withstand roughly 16 Gs of crash impact.
- **Survivable Impacts:** Humans have survived brief deceleration forces between 20 Gs and 40 Gs, though significant injuries or internal trauma are likely at these levels. Facebook · War History Online +2
- **High-Impact Crashes:** High-speed impacts can generate hundreds of g-forces. For example, calculations from the Swissair Flight 111 disaster estimate the final impact forces reached roughly 350 Gs. Wikipedia

AI Overview

There is no single "kill" number for G-forces, as lethality depends heavily on **direction** and **duration**.

- **Sustained G-forces:** 4 to 6 Gs sustained for more than a few seconds causes blood to pool, leading to unconsciousness. 10 Gs for a minute is typically fatal.
- **Instantaneous impacts:** Humans can withstand massive, split-second impacts up to 50–100 Gs if strapped into proper safety restraints. hypertextbook +4

AI Overview

A typical small airplane crash involves **rapid deceleration forces ranging from 20 Gs to over 100 Gs**, depending on the impact speed, the angle of the crash, and how quickly the aircraft's structure collapses to absorb the energy.

Because the exact G-force varies based on the crash dynamics, several critical factors apply:

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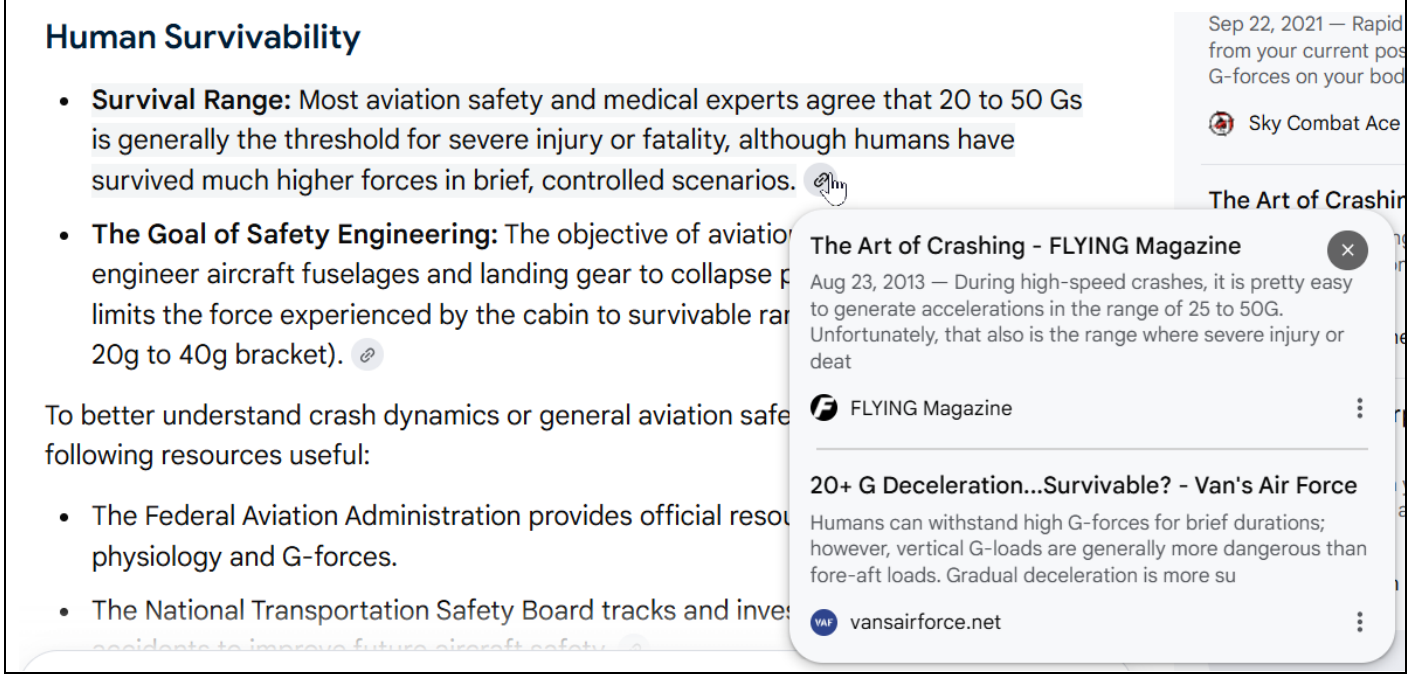
Human Survivability

- **Survival Range:** Most aviation safety and medical experts agree that 20 to 50 Gs is generally the threshold for severe injury or fatality, although humans have survived much higher forces in brief, controlled scenarios.
- **The Goal of Safety Engineering:** The objective of aviation crash safety is to engineer aircraft fuselages and landing gear to collapse progressively. This design limits the force experienced by the cabin to survivable ranges (often capped in the 20g to 40g bracket).

So any impact deceleration of about 50g may be survivable.
Above 50g, the body will interanlly/ fataly 'smoosh' regardless of other factors.



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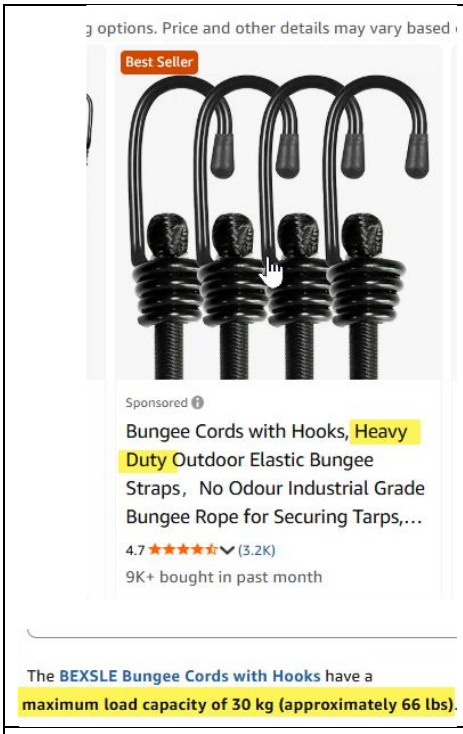

So for reference, the

1) **TOP SELLING,**
2) **OUTDOOR,**
3) **“Heavy Duty”**

Bungee cord on Amazon has a breaking strength of under 70lbs

The Physics (Do Bungees soften the blow?)

Restraining Force

'Impact' is often reported in "**G Force**", which makes the math much, much easier:

So our 25 lb object, at even 30 g of impact, will experience a Force of *750* lbs

AI Overview

A 15g force means an object experiences an acceleration equal to 15 times the standard acceleration of gravity. Therefore, a 100 lb person subjected to 15g would experience a force of 1500 lb (calculated as $100 \text{ lb} \times 15 = 1500 \text{ lb}$).

For reference, this means the person's body will feel 15 times heavier than it normally does on Earth.

So for example a seat belt with a maximum breaking strength of 1,000 lbs will keep the passenger in their seat, not thrust into the yoke; but at only 500lbs it would break and the occupant would not be kept in their seat.

In anticipation of the argument that '**Oh, but the bungee cord will absorb some of that impact'**, the following math contradicts that assertion as

"The forces upon impact are literally 100's and possibly 1,000 times greater than any restraint offered by bungees."

The analysis centers on "**Energy**":

1) The **Kinetic Energy** (that some may call 'momentum') of objects moving at a given speed (call it 100 Kts, or in metric: 51 meters/second)
2) The **Work Energy** of the 'Spring Force' of Bungees

Kinetic Energy = ½ * m * V^2. where m = Mass and V = Velocity (speed)

Doing this in metric (because it is so much cleaner) for an object that weighs about **25 lbs (10Kg**), at an impact speed of 100 kts (51.4 meters/second), you have **Kinetic Energy of**

= ½ * 10 * $(51)^2$
= ½ * 10 * (2,601)
= 13,00 (Joules)

Springs (which is effectively what a bungee is) are quantified by their 'hook constant', which is the Force they exert per foot of extension. From personal experience, if you stretch even the 'thickest' bungee cord that you are likely to buy at Amazon/HomeDepot/Lowes, etc, you might exert maybe **10lbs of force for every foot you stretch**. (If you wanted to, you could simply hang a 10lb weight from it, and measure the length of the stretch!).

From physics, we know that

Work Energy = Force x Distance

Technically, it is the continuous integral of $\int_a^b f(x)dx$ but this meticulous answer turns out to be only ½ of the simple number that we'll calculate as a constant multiplication.

Being consistent with metric, 25lbs of force is 10 kg of mass (on Earth) or 98 'Newtons' (N) in the metric system
If the bungee stretches 3' (1 meter) before snapping, the total amount of energy it absorbs is:

98N x 1 = 98 **(Joules)**

Technically it's only ½ that **(49)**, since the spring force starts at 0, and works it way up to the total

That's correct:

13,000 (Joules) of Kinetic Energy upon impact, offset by
50 (Joules) of 'spring shock/absorber' energy
50/13,000 = 0. 00384, is 0.38Percent : **1/3 of 1 % of the kinetic energy is absorbed by a bungee**

My Implementation