

THEY FLEW FOR A FEW HOURS,
YET THE WORLD BELOW THEM AGED BY YEARS.

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Abstract:

This is the mind-bending puzzle of MANIFEST – a gripping science-fiction series where the routine three-hour flight turns into a five-year mystery. A commercial aircraft enters into a violent turbulence caused by an intense thunderstorm that the plane briefly disappeared from radar and returned with its passengers unchanged, untouched by the years that slipped away beyond them. Families moved on, lives transformed, and the world rewrote its stories – while for the passengers, the journey never felt longer than a few hours.

Is this purely fiction –or could modern physics really allow time itself to stretch, bend or drift like this? To explore that question, we step into the fascinating science of time dilation, relativity and the strange flexibility of spacetime itself.



Introduction:

Events that challenge our everyday understanding of time often find their roots in the principles of modern physics. The mysterious time gap portrayed in the series MANIFEST draws attention to a fundamental question in physics: **does time flow at the same rate for everyone?**

Time feels constant because human experience is slow compared to the scale at which nature truly operates. A second passes as a second, a journey ends when expected, clocks agree with one another- In everyday life Classical physics was built upon this intuition, treating time as an absolute quantity that flows at the same rate for everyone, everywhere, no matter what. However modern physics reveals that this comfort is an illusion. This article investigates whether the phenomenon depicted in the series is physically possible.

PHYSICAL EXPLANATION:

Velocity Time Dilation (Special Theory of Relativity)

'Moving clock runs slowly' – a statement given by Albert Einstein in his special theory of relativity referring to the concept of 'time dilation' demonstrating that time is not an absolute quantity and can vary depending on the factors like speed and gravity. If an object moves close to the speed of light, its clock runs slower compared to the clock of people watching from outside. For the object less time has passed as compared to the observers.

The amount by which time slows down at high speed is: $t = \frac{t_0}{\sqrt{1 - \frac{v^2}{c^2}}}$.

To estimate relativistic time dilation at maximum aircraft speed, consider a velocity of 1000km/h (278 m/s). using the velocity time dilation formula, the ratio v/c is about 9.27×10^{-7} , giving Lorentz factor extremely close to 1. For a 3-hour (10800s) flight. The calculated time shift is approximately 4-5 nanoseconds. This shows that even at the highest realistic aircraft speeds, relativistic time dilation produces an effect that is negligibly small and cannot account for large missing time intervals.

Gravitational Time Dilation (General Theory of Relativity)

Gravity becomes stronger when the mass of an object is larger as more mass causes more space time curvature and stronger curvature leads to greater time dilation. Near a black hole, an enormous amount of mass is packed into a very small region, creating extremely strong gravity – because of this, time slows down drastically, and minutes there could equal years for a distant observer.

The formula for gravitational time dilation is: $t = t_0 \sqrt{1 - \frac{2GM}{rc^2}}$

At higher altitude gravity is slightly weaker, so time runs slightly faster. For an aircraft at about 10 km height, the calculated gravitational time difference over a 3-hour flight is only a few nanoseconds, which is practically negligible.

COULD A THUNDERSTORM CAUSE TIME TO SHIFT BY YEARS?

A Thunderstorm contains strong electric field, huge current in lightening, powerful electrical activity and dense storm clouds. But none of these can bend space time, slow time significantly, and generate gravitational fields strong enough for time dilation.

So a thunderstorm cannot physically cause time dilation. If such a dramatic effect were to occur, it would require enormous amount of energy and phenomena's far beyond atmospherics storms, possibly involving extreme spacetime structures such as wormholes or region of intense gravitational collapse.

THEORETICAL POSSIBILITIES.

1: WORM HOLE FORMATION.

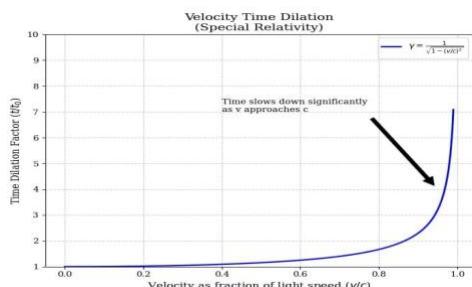
A wormhole is a hypothetical tunnel-like structure in space time predicted by the equations of Einstein's general theory of relativity, which could connect two distant points in space and possibly time. Although such structures have never been observed, they arise as mathematical solutions under conditions of extreme space time curvature. In MANIFEST, the electrical disturbance inside the dense clouds and the strange bright glow may symbolically represent a temporary tunnel-like formation connecting the region with another spacetime- suggesting that the plane briefly entered a different spacetime and returned with years passed on earth. However, a wormhole formation would require conditions which cannot be achieved on earth's atmosphere.

2: SINGULARITY

Imagine a situation where the known laws of physics fail to work. There is such a region called a **singularity**- a point where mass is compressed into an extremely tiny place, causing gravity and spacetime curvature to become

infinitely large, so the usual equations no longer apply. While no such condition could realistically form inside a thunderstorm, and atmospheric phenomena on earth cannot reach a singularity.

Result and discussion



The velocity-time graph shows that relativistic effects are negligible at normal speeds and rise sharply only near the speed of light.

To produce such a large gap of five-years for a 3-hour flight. The required dilation factor is about 14600 which corresponds to a speed = 0.999999998 times the speed of light – which is not possible for an aircraft.

Conclusion

The mysterious phenomena shown in **Manifest** is mainly a scientific idea presented with a supernatural approach. In reality, no earthly phenomena can vary time on such a scale. A commercial plane can never achieve a velocity comparable to the speed of light; air resistance would completely destroy the aircraft long before such a speed is reached.

The only possible case would be if the plane were replaced by a spacecraft capable of travelling at extremely high speeds and producing measurable time dilation. But even then, creating a gap of five years would require conditions far beyond our present technology.

Thus, the series is a work of science-fiction and remains outside the limits of real-world physics. In the end, both science and storytelling remind us of the same thing: The universe holds possibilities far beyond what we see in everyday life.

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