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## Travel Safety: Time versus Distance

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## Travel Safety: Time versus Distance

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Many references to travel safety, especially in regards to aviation, often refer to fatalities per passenger mile or kilometer. It will be argued here that a better measure for transportation safety analysis would be to measure fatalities per passenger hour instead of per passenger mile or kilometer. Note that fatalities differ for larger vehicles wherein a fatality in a car may be associated with a fewer fatalities per vehicle whereas for airlines or rail it may be associated with a higher number of fellow fatalities per vehicle. The major thrust of this article is to consider the extreme cases of not traveling at all versus traveling at a very high speed and thus a greater distance. In not traveling at all, one might incur an otherwise actuarial fatality with an hourly computation here being finite but with the mileage computation dividing by zero and creating a nominally infinite fatality rate! Likewise in an opposite case for a fast but dangerous travel (like the Space Shuttle) would result in a lower fatality rate with a distance based rate, but not in terms of a time based rate! Indeed, I suspect that distance traveled rates are promoted in that a more favorable comparison results for air travel.

| Fatalities per billion: | Journeys    | Hours   | Kilometers |
|-------------------------|-------------|---------|------------|
| Air                     | 117         | 30.8    | .05        |
| Bicycle                 | 170         | 550     | 44.6       |
| Bus                     | 4.3         | 11.1    | .4         |
| Car                     | 40          | 130     | 3.1        |
| Foot                    | 40          | 220     | 54.2       |
| Motorcycle              | 1,640       | 4,840   | 108.9      |
| Rail                    | 20          | 30      | .6         |
| Space Shuttle           | 103,703,703 | 438,019 | 16.2       |
| Van                     | 20          | 60      | 1.2        |
| Water                   | 90          | 50      | 2.6        |

In comparing travel fatality rates measured by time, bus travel is safest followed by air and rail, then by water and van. Further note that the aviation industry uses hours for maintenance purposes, not distance. Moreover, consider that one does not allocate miles in one's lifetime but the hours in one's life. Below find citations for accidents and fatalities for driving, airlines as well as general aviation (GA) and other modes of transport (I've also computed the journey times, speeds, and lengths of trips from the statistics which tend to confirm their authenticity). Note in particular the Space Shuttle figures (14 deaths in 135 flights) go to illustrate my argument in that this mode of travel had a fatality rate of about one per ten journeys, but when measured per distance traveled was safer than walking and bicycling let alone motorcycles! I should also note that I have a letter from Alfred E. Kahn (when he was head of the then Civil Aeronautics Board) agreeing with me.

### References

- driving: 1.32 fatal accidents and 1.47 fatalities per 100 million miles
- airlines: .05 fatal accidents and 1.57 fatalities per 100 million miles
- GA: 7.46 fatal accidents and 13.1 fatalities per 100 million miles
- <http://www.meretrrix.com/~harry/flying/notes/safetyvsdriving.html>

See my video on this subject at: <https://www.youtube.com/watch?v=ADinl3FL0L0>

| Fatalities/<br>Billion | Journey   | Time h/j | Hour   | Speed k/h | Kilometer | Length k/j  |
|------------------------|-----------|----------|--------|-----------|-----------|-------------|
| Air                    | 117       | 3.8      | 30.8   | 616.0     | 0.05      | 2,340.0     |
| Bicycle                | 170       | 0.3      | 550    | 12.3      | 44.6      | 3.8         |
| Bus                    | 4.3       | 0.4      | 11.1   | 27.8      | 0.4       | 10.8        |
| Car                    | 40        | 0.3      | 130    | 41.9      | 3.1       | 12.9        |
| Foot                   | 40        | 0.2      | 220    | 4.1       | 54.2      | 0.7         |
| Motorcycle             | 1640      | 0.3      | 4840   | 44.4      | 108.9     | 15.1        |
| Rail                   | 20        | 0.7      | 30     | 50.0      | 0.6       | 33.3        |
| Shuttle                | 103703703 | 236.8    | 438019 | 27,038.2  | 16.2      | 6,401,463.1 |
| Van                    | 20        | 0.3      | 60     | 50.0      | 1.2       | 16.7        |
| Water                  | 90        | 1.8      | 50     | 19.2      | 2.6       | 34.6        |

Note that aviation safety does not include the necessary ground transportation

[http://en.wikipedia.org/wiki/Aviation\\_safety](http://en.wikipedia.org/wiki/Aviation_safety)

Original data from:

| Deaths per billion journeys      | Deaths per billion hours      | Deaths per billion kilometres |
|----------------------------------|-------------------------------|-------------------------------|
| <u>Bus</u> : 4.3                 | <u>Bus</u> : 11.1             | <u>Air</u> : 0.05             |
| <u>Rail</u> : 20                 | <u>Rail</u> : 30              | <u>Bus</u> : 0.4              |
| <u>Van</u> : 20                  | <u>Air</u> : 30.8             | <u>Rail</u> : 0.6             |
| <u>Car</u> : 40                  | <u>Water</u> : 50             | <u>Van</u> : 1.2              |
| <u>Foot</u> : 40                 | <u>Van</u> : 60               | <u>Water</u> : 2.6            |
| <u>Water</u> : 90                | <u>Car</u> : 130              | <u>Car</u> : 3.1              |
| <u>Air</u> : 117                 | <u>Foot</u> : 220             | <u>Space Shuttle</u> : 16.2   |
| <u>Bicycle</u> : 170             | <u>Bicycle</u> : 550          | <u>Bicycle</u> : 44.6         |
| <u>Motorcycle</u> : 1640         | <u>Motorcycle</u> : 4840      | <u>Foot</u> : 54.2            |
| <u>Space Shuttle</u> : 103703703 | <u>Space Shuttle</u> : 438019 | <u>Motorcycle</u> : 108.9     |