

## Comments to the idea of a WARP drive.

A.V. Antipin     [a1\\_mail@inbox.ru](mailto:a1_mail@inbox.ru)

*The paper presents general considerations, that show that the WARP devices will not be able to provide the expected superluminal velocity of moving objects. The actual speed of the moving objects using WARP will not exceed  $(c/2)$ , i.e. HALF the speed of light.*

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*Russian version of the article: <http://vixra.org/abs/1711.0377>*

### A.

The idea for superfast travel using WARP drive (hereinafter - WARP), is based on the work of M. Alcubierre from 1994. [1].

The approach outlined in the article, was developed by G. White, who managed to interest his ideas, the leadership of NASA has received funding and has begun the practical work. In particular, his lab built the interferometer [2], which is aimed to explore how the fundamental possibility of obtaining WARP folds and its basic properties.

We will not deal with mathematical, physical and engineering sides of the issue, i.e., will not discuss - is it possible to WARP in principle. We are interested in only one thing, which is very General in nature and limits the speed of moving objects using WARP sublight speed.

In Fig.1 shows a sketch for explaining the expected effect of the WARP travel. This figure is convenient for our purposes, the fact that vertical grid "geodesic" can be used to illustrate our ideas. The figure held about 70 such lines, in addition of the labeled points of departure and arrival, and WARP the ship.

We assume, for definiteness, that the distance between the "geodetic" is one light-year (HEREINAFTER "LY"), i.e. the distance that light will travel in a year. Then we can say that if you take the LEFT edge of the figure as the reference (0 LY), then the RIGHT edge will have coordinates 73 LY. Also, without any loss of generality, we assume that the objects in the sketch are the points: Goal - 5 LY, "WARP ship" - 35 LY and "Earth" - 70 LY.

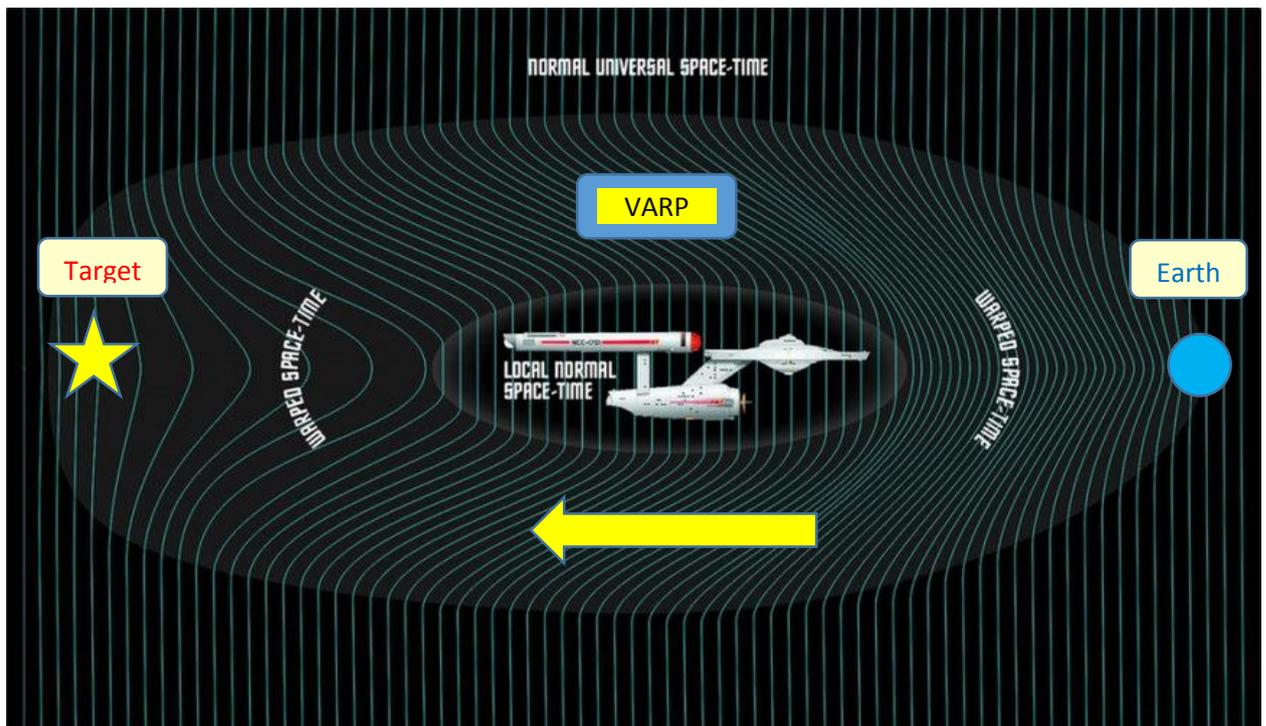


Fig.1

The figure shows that the principle of WARP travel is that space BEHIND the ship (RIGHT) "crumples" and "compacted», " and in FRONT of the ship (LEFT) – " decrease " and "reduced".

I. e. there is a certain "dragging" of "space" (whatever it means!) through point location ship and "compaction" this space right from ship for moreover, to "reduce", "thin" space AHEAD him.

For example, looking "from God's position" on the above sketch shows that the ship "compactification" for about 30 LY, and BEFORE the ship of space " decrease " to 7-8 LY.

From this it is concluded that the WARP of the device, IN PRINCIPLE, can ensure superluminal speed, and even at times, and, in fact, an unlimited number of times exceeding the speed of light (because the "vacuum" can be brought, as expected, up to an arbitrarily small value). Thus, it is assumed that the ship will spend for your trip significantly less time than it takes light to overcome the same distance.

On the sketch it is seen that in "normal", not the distorted space light takes 30 years to overcome the distance between the position of the WARP and " Goal " (as follows from our conditional markup sketch). On the other hand, WARP and "Goal" parts approximately 8 SG in the "distorted" space (the number of distorted " geodesy " scale lines). Thus, the distance is much smaller. It is additionally assumed that the ship overcomes this "thinned" space is not slower than 8 years.

As a result, the WARP speed of the ship in the sketch, enthusiasts appreciate approximately, 3 the speed of light.

## B.

However, from our point of view, this approach overlooked that "space" as such does not exist. All objects are "placed" in a 4-dimensional complex Space-Time, and the Space-Time, in addition to its other fundamental properties, limits the transmission of signals and interactions the speed of light "C".

Also, enthusiasts of the ideas have been completely lost, the phenomenon of "transition process" - i.e., the period of time during which he was going to "fold" OVER the ship and, accordingly, there is the "vacuum" of space in FRONT of him. And it doesn't happen instantly.

Given the above, we assume that if the WARP (i.e., a device that distorts Space-Time in this way), and implement technically, when it is turned on, the following will happen.

Will start a transition process to "fold" BACK from the WARP (i.e., to the RIGHT of it) and, simultaneously, the "dead space" in FRONT (to the LEFT).

Here we must recall that for the construction and argumentation theory, a WARP is used the General theory of relativity: its ideas about curved Space-Time, its conceptual and mathematical apparatus, and, of course, basic physical concepts.

Thus, it is assumed that the process of "distortion" of space to a remote point CAN NOT occur faster than the agent (carrying out this crumpling) reaches the specified point. And this, due to the basic laws of modern physics, can not happen faster than the speed of light.

Moreover, this is only the initial moment of creation of the distortion and to complete the process, WARP will need the same time.

Indeed, EACH involved in the process WARP point space to the LEFT of the device (located at a distance R), will be involved in this process **NOT EARLIER** than it reaches the agent, providing the WARP. I.e. not earlier than  $dt(1) = R/c$  from the moment of INCLUSION.

And then, to create distortion, this point should be "displaced" to the RIGHT of the WARP.

But this process cannot be carried out at a speed greater than the speed of light, i.e., FASTER than  $dt(2) = R/c$  (c is the speed of light).

And, thus, the MINIMUM total time to create distortion:  $dT(\text{WARP}) = dt(1) + dt(2) = 2 * R/c$ .

This implies that even if we assume that at the time of completion of the "drag" of the considered point to the RIGHT of the WARP, the WARP itself "as if" will move to that point in "normal" space, speed of such movement is equal to:  $V(\text{WARP}) = R/dT(\text{WARP}) = (c/2)$ , and NOT SUPERLUMINAL!

Moreover, the specified period of time  $dT(\text{WARP})$  is the same for the EXTERNAL reference system and for its OWN (ie ship-WARP) reference system.

The fact that each "moved" from left to right (through the WARP) geodetic manifests not only space but also time. Thus, the "dragging" through the point of placing the WARP "a piece of space, length" 1 light second (i.e. 300 thousand km distance), CAN NOT take less than 1 second of time, because no process can travel faster than the speed of light in the frame of reference where it is observed.

Thus, the actual "dragging", for example 100 SG space will take at least (!) 100 years. And the WHOLE process move (from the start to WARP) - 200 years, as explained above. And in the remote reference system and the reference system associated with the WARP will be the same time in 200 years!

C.

**Thus, WARP is NOT a means of FTL TRAVEL.**

On the contrary – the maximum speed of moving objects with it is only half the speed of light (C/2), i.e. 150 thousand km per second. For all its fabulousness of today, this speed is absolutely not sufficient for

a systematic, routine interstellar travel. Flight even to the nearest star and back will take about 17 years...

In addition, in the case of WARP, the crew is deprived of such benefits as slowing down time in the ship. Remember that, as stated above, the "rate of flow of Time" in the ship – does NOT CHANGE. So a 100 LY expedition to a WARP ship would take 200 years to travel from Earth to the Target and another 200 years to return to Earth by ship clock. These terms are, of course, UNACCEPTABLE!

On the other hand, for distances within the Solar system, and especially for the distances between objects on the Earth, the possibility of WARP travel looks very attractive. Indeed, "Assembly folds" is a fraction of a second for distances on the Earth, three seconds move to the Moon, from several minutes moving to Mars/ Venus to 6-8 hours of travel to Pluto, which is more than acceptable.

Thus, from our analysis, it suddenly became clear that the WARP should not be considered as an interstellar travel engine, but as the first, relatively well-founded project of a "portal of movements" inside the Solar system.

**First**, we have a user-satisfying speed of movement – no more than a few hours to the most remote objects located in the area of Pluto.

**Second**: engineering organization Portal on Earth, on the Moon, or in near space significantly – by orders of magnitude – simplifies the issue of ensuring ENERGY device WARP.

There is no doubt that it is impossible to compare the convenience and efficiency of the supply of WARP power from stationary, long-term, serviced by its own personnel power producers (for example – hydroelectric power plants, nuclear power plants and other sources of generation) and the need to generate similar power on Board, in an Autonomous flight.

Thus, the future of WARP (if its technical implementation is possible) is a stationary portal that makes the transfer of objects to the right place, mainly within the Solar system.

#### Literature.

1. The warp drive. M. Alcubierre, Class.Quantum Grav. 11 (1994).
2. [https://en.wikipedia.org/wiki/White%E2%80%93Juday\\_warp-field\\_interferometer](https://en.wikipedia.org/wiki/White%E2%80%93Juday_warp-field_interferometer) (2019)