Planes of Simultaneity and the Speed of Light

The foundations of the theory are directly linked to the question of whether or not one grants a physical meaning to the planes of simultaneity.

- If the planes of simultaneity are purely conventional (without any real physical significance), then the speed of light is not truly invariant in all reference frames. It is merely a convention of synchronization, not a universal physical constant.

- If, on the contrary, the planes of simultaneity have a real physical significance, this leads to logical contradictions. For example, a missile already launched could—solely due to a change of reference frame by an accelerating observer—find itself located in the past, at a moment when it has not even been assembled yet. This violates the very idea of a realized event.

In both cases, the conclusion is the same: the speed of light cannot be invariant.