The Swiss bicycle manufacturer BMC faces a few damaged forks each year. As the defect takes place under the stem, complete failure causes sudden crash and can be dramatic. The purpose of this project is to understand the reason(s) of these defects and to propose solutions.

To improve fork steerer tube safety, fork assembly and external loads are studied. From there, a Finite Element Model is built and an experimental drop test is set up.

The FEM simulations show that if play is present in the assembly, stresses on the steerer tube double. A poorly mounted fork is therefore a probable reason for damaged tubes. The drop test draws attention to a manufacturing problem. During forks production in Asia, a reaming operation is processed inside the tube. This operation is sometimes imprecise and leads to material removal, limiting tube strength.

Two solutions are proposed to strengthen the steerer tube. The first one consists in a change of the laminate, while the second combines material modification and geometric change. A flat is inserted at the front of the tube to allow better stress distribution and a metallic insert is added inside the stem. According to the FEM, both solutions avoid failure, even when play is present in the assembly.

Concerning the manufacturing issue, a better control is advised. Some non structural material could also be added in the tube, decreasing the reaming diameter. Therefore an imprecise reaming can’t damage the structural material.

The project shows that failures are probably due to two reasons. The first one is the presence of play in the assembly. This problem can be solved through a better communication with bike users. The steerer tubes can also be strengthen using one of the solutions developed during this thesis. The second reason is a manufacturing mistake in Asia. A better control should therefore be set up and a change in the reaming diameter might be considered.