In many models of the Calvin cycle of photosynthesis, it is observed that there are solutions where concentrations of key substances belonging to the cycle tend to zero at late times, a phenomenon known as overload breakdown. In this paper, we prove theorems about the existence and non-existence of solutions of this type and obtain information on which concentrations tend to zero when overload breakdown occurs. As a starting point we take a model of Pettersson and Ryde-Pettersson which seems to be prone to overload breakdown and a modification of it due to Poolman which was intended to avoid this effect.