



# Mach number, relative thickness, sweep and lift coefficient of the wing

## - an empirical investigation of parameters and equations

Aufgabenstellung zum *Projekt* gemäß Prüfungsordnung

### Background

In aircraft design, the wing parameters "relative thickness" and "sweep" follow from a demand for a certain cruise Mach number at low wave drag. In addition, the cruise lift coefficient and the type of airfoil have an influence on the aerodynamics of the wing. If there is a demand for a higher cruise Mach number during aircraft design, the sweep has to be increased or the relative thickness has to be decreased. The transonic flow around a wing can not be described with simple equations. For this reason, the relationship between the parameters as given above will be based in preliminary aircraft design on statistics of known aircrafts.

### Task

Equations based on statistical data relating Mach number, relative thickness, sweep and lift coefficient of the wing have to be investigated, checked and improved for their suitability in preliminary aircraft design. The project's task includes these subtasks:

- Introduction to transonic flow around wings.
- Literature search for equations dealing with the relationship of named parameters.
- Theoretical substantiation of the empirical equations as far as possible.
- Investigation of aircraft parameters for sample calculations with equations from the literature.
- Comparison of equations based on sample calculations. Selection of the most suitable equation.
- Adaptation of this equation to further improve the accuracy based on given aircraft parameters.

The report has to be written according to German DIN standards on report writing!