The aim of the project is to undertake comparison within the fatigue test results on the same material performed under various loading conditions and to acknowledge base on that an image showing the magnitude of their diversity, including fatigue characteristics. Our objective is to perform a series of fatigue tests on specimens made of 6082 aluminium alloy. These tests will differ in the state of strain. There will be performed fatigue tests as follows:

- Tests under controlled strain condition:
  - pendulum bending
  - pendulum torsion
- Tests under controlled stress condition (complementary research tests):
  - pendulum bending
  - pendulum torsion

Thereby obtained fatigue characteristics will be properly compared within these results and with results derived under controlled strain condition by using a device carrying out loads under tension-compression (parameters described by **M**anson-**C**offin-**B**asquin (**MCB**).

Due to different state of strain in specimens subjected to tension, compression and pendulum bending, it will be not possible to receive the **MCB** characteristic for pendulum bending.
The model can be applied explicitly in the case, if it is possible to designate separately the elastic and plastic portions of the total strain.

The correlation between the stress and strain amplitudes is described by the Ramberg-Osgood equation. However, we often come across a problem concerning unambiguous separation of plastic and elastic parts of the total deformation. Such problem occurs – for example – when the stress amplitude σ_a is twice as the cyclic yield strength R'_e.
Another example of this type of situation was stated by Radhakrishnan, he proves that the validity of plastic strain portion of the total strain in the formula is dependant of fatigue strength, whereby the fatigue ductility exponent ***c*** does not exceed the value of constant.
Therefore, it will be necessary to utilize other model for description of fatigue test results for both types of tests.
Different authors suggested empirical models in which the strain amplitude is dependant of the number of fatigue cycles. It this project, it is planned to use at least three models by: Kandil, Langer and the one suggested by the authors of the grant.

These models will be applied to describe the results of controlled strain-based pendulum bending and torsion, as well as tension-compression. Adequate analyses of research test results will be also performed under the same type of stress forces (pendulum bending and torsion) carried out under controlled strain and bending moment.

The main reason for undertaking such subject matter is the fact that in the research literature is noticeable lack of both, the research test results and adequate method for describing these results from tests under pendulum bending, torsion or a combination of thereof being performed under controlled strain state. Theses research tests aim to demonstrate the validity of this kind of experiments but also to indicate fatigue characteristics models that are best suited to their descriptions. By the fact that for research testing was selected well-known and already analysed type of material (6082 aluminium alloy), verification of the obtained results and findings with those available in the research literature will not be a concern.