



## Fatigue limit test stand

Project number: J150424

### Goal:

The goal of the project is to develop a test bench for helicopter shafts for the company Zoerkler. The test bench is designed to support the proof of fatigue strength of the shaft and the detection of the torsional stiffness of complete shaft assemblies. The test bench should - as opposite as the previously measurement method - be used to bring a significant shortening of the measurement time and a reduction in energy consumption. It should be able to investigate different combinations of rear drive shafts. The test procedure is completely automatic. In addition to the design and construction there is the task of selecting high quality instrumentation and to develop a powerful software for controlling the measurement process and to control the required torque on the shafts.

### Description:

Design and construction of the mechanics of the test bench had been carried out in the previous school year as part of a thesis. The procurement and manufacturing of the parts of the mechanical structure were done by Zoerkler. Our task is to develop an efficient and cheap driving concept. This should be implemented into the basics of the structure. The test shaft is part of a torsional resonance oscillator which also includes a flywheel. This can be brought into swing and kept stable with minimal energy input with very high energy content. It's like a swing for children: With very little nudge, it is possible to obtain an oscillation with a very large amplitude upright.

The construction of the test bench has already been done. Also these of us designed instrumentation has been built in and tested. For this we use a self-created data-acquisition- and control-software. This will be regularly optimized for the system.

Because the expenses that Zoerkler had to do are very large and because of the new concept, a success of our project was not secured. So we made a fallback-solution. If our concept fails because of technological or fundamental reasons, the construction and a part of the instrumentation for the realization of a test bench according to the prior art can be used.

Our project is challenging, exciting and interesting. Working in a high technology environment, the cooperation with Zoerkler, the project group of the previous year and the support of our workshop teachers make our project to a real 'Networking'.

Our innovation lies particularly in the efficiency of using energy and time. It reduce the development costs of the company and forms a significant competitive advantage over the competition, because you can test the helicopter shafts faster.

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maintenance  
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### Results:

In the current state of the project it can already be noted that this test bench will bring a revolutionary advance of the aviation industry. Now it is already possible to test these helicopter shafts with a load cycle frequency of 7 Hz and even more. The test bench can be expanded and improved as desired. This means that theoretically there are no limits to the test frequency and the test torque. So an efficient and rapid testing process of helicopter shafts is possible. Also a working software for measurement and control has already been created

### Cooperation in team:

The tasks in the team are set firmly. But for sure we support each other in order to achieve the fastest possible progress.

If there is a problem, the whole team, containing of the students and the supervisor gets together for looking for a solution. This brainstorming is performed and all the little ideas are combined into an overall concept.

Especially at a project like this, which is mainly about development and optimization, a motto is always in the foreground:

„ There are no stupid ideas! "

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