

I. IDENTIFICATION DATA

Thesis title:	COMPLEX ASSESSMENT OF PILOT FATIGUE IN TERMS OF PHYSIOLOGICAL PARAMETERS
Author's name:	Dilara Duman
Type of thesis :	bachelor
Faculty/Institute:	Faculty of Transportation Sciences (FTS)
Department:	Fakulta dopravní
Thesis reviewer:	Dr. Boris Oniščenko
Reviewer's department:	Institute of aviation medicine Prague, Department of flight safety

II. EVALUATION OF INDIVIDUAL CRITERIA

Assignment <i>How demanding was the assigned project?</i>	extraordinarily challenging
<p>Fatigue is a very complex human state characterized by many factors. Although the title is aimed on fatigue in general, the content is focused mainly on heart rate variability. HRV is also a method which is not widely standardized. So both of these main points of work are demanding to describe by themselves. Main challenging factor is then to find a solid output for the conclusion and also finding the right amount of background information for each fatigue and HRV.</p>	

Fulfilment of assignment <i>How well does the thesis fulfil the assigned task? Have the primary goals been achieved? Which assigned tasks have been incompletely covered, and which parts of the thesis are overextended? Justify your answer.</i>	fulfilled with minor objections
<p>Primary hypothesis, as stated in "introduction" was researched and there is a conclusion in that matter. However, the work mentions a lot of information which are somehow not directly connected to the main plot of the work. They raise other questions which are not later addressed. Main concern in this meaning is the connection of the fatigue evaluation during the experiment to the HRV which would maybe benefit from some clarification.</p>	

Methodology <i>Comment on the correctness of the approach and/or the solution methods.</i>	correct
<p>Methodology for the hypothesis is correct and present. I would prefer deeper reflection on combination and interconnection of provided information (chapters about fatigue and HRV itself) into the methodology. Statistical analysis is then not my area of expertise.</p>	

Technical level <i>Is the thesis technically sound? How well did the student employ expertise in the field of his/her field of study? Does the student explain clearly what he/she has done?</i>	A - excellent.
<p>Technical level is high throughout the whole work. Presentation of HRV analysis as a method is sufficient to stand itself as an overall material about the topic. Also the ECG evaluation process is very detailed. I lack a little deeper approach to the complex evaluation of fatigue in conclusion – as it should be a topic of the work.</p>	

Formal and language level, scope of thesis <i>Are formalisms and notations used properly? Is the thesis organized in a logical way? Is the thesis sufficiently extensive? Is the thesis well-presented? Is the language clear and understandable? Is the English satisfactory?</i>	C - good.
<p>I found some unexplained abbreviations through the work. I would recommend a more systematic approach – either explain abbreviations in the text or add all of them into the list at the beginning. There is a lot of information in the work. I think that the work would benefit from some limitation of the scope. It starts very widely, but the conclusions are rather very specific and in some point of view distant from the sound of the title and the opening description of the work. Information are correct as they are, but this is rather a suggestion towards the logical connections between otherwise detailed and very good chapters.</p>	

Selection of sources, citation correctness

A - excellent.

Does the thesis make adequate reference to earlier work on the topic? Was the selection of sources adequate? Is the student's original work clearly distinguished from earlier work in the field? Do the bibliographic citations meet the standards?

References used in the thesis are used at expected places, rationally supporting the presented information. There are sufficient reference count. Places, where the text is somehow in the form of the author "opinion", are practically absent.

Additional commentary and evaluation (optional)

Comment on the overall quality of the thesis, its novelty and its impact on the field, its strengths and weaknesses, the utility of the solution that is presented, the theoretical/formal level, the student's skillfulness, etc.

See in the overall evaluation

III. OVERALL EVALUATION, QUESTIONS FOR THE PRESENTATION AND DEFENSE OF THE THESIS, SUGGESTED GRADE

The work is very detailed and extensive. Fatigue is also a very important problem in civil aviation. Its evaluation is needed and any work aimed at using objective measures may be useful. Heart rate analysis is (and has been) used or tried to be used in many areas, but the results are sometimes uncertain. Author goal to precisely find how to evaluate HRV with a combination of fatigue is then an excellent idea. Finding a specific conclusion to a specific hypothesis would be a solid output. But this is also a weakness of presented work. There is a lot of background information which in my opinion shifts attention from the main goal. Author could probably focus only on the primary hypothesis and limit the physiological background and consideration of the fatigue. It would be probably a much less friendly text in the meaning of presentation for others, but somehow more focused and precise. This shouldn't be taken as a "mistake", but rather as an opinion, that the work is to some level split into two main plots, which are both taking our attention, stressing the author's resources and are not meeting tightly in the later parts of the work.

But I want to emphasize that the work is very good and pleasant to read. It feels that the author was confident with a topic and wrote it with interest. It also opens some possibilities for further research and it is in some ways innovative.

- If the question should be raised during the presentation, I would ask the author to discuss the 2.4.1 chapter – choosing to use HRV method to evaluate levels of fatigue. There are some described methods for fatigue evaluation - the author could mention some information from used citations to give us some "levels" of reliability of different methods and justify his choice.
- I would also ask the author to discuss if some of the modern devices ("wearables" – smart watches) capable of heart rate analysis could be potentially usable for providing real-time personal information for the person wearing it – and if not, if the limitations are of some general nature.
- I would be interested in used physiological evaluation tests and their results. They are mentioned only superficially.

The grade that I award for the thesis is **B - very good**.

Date: **6.1.2021**

Signature: