

I. IDENTIFIKAČNÍ ÚDAJE

Název práce:	Mechanické vyhodnocení vstupů letadla v podmínkách testů letového výzkumu (Mechanical evaluation of the aircraft inlet under the flight research test condition).
Jméno autora:	Daniel Maštalíř
Typ práce:	bakalářská
Fakulta/ústav:	Fakulta strojní (FS)
Katedra/ústav:	Ústav mechaniky, biomechaniky a mechatroniky Odbor mechaniky a mechatroniky
Oponent práce:	Ing. Andrzej Cwik, MBA
Pracoviště oponenta práce:	CVUT, Fakulta strojní

II. HODNOCENÍ JEDNOTLIVÝCH KRITÉRIÍ

Zadání (Entering)	mimořádně náročné
<i>Hodnocení náročnosti zadání závěrečné práce. (Assessment of the complexity of the final thesis).</i>	
The subject of the thesis was a mechanical evaluation of the aircraft inlet instrumentation under the flight research test condition. Thesis activities are concentrated on airflow instrumentation. Work is described in very good way and with good balance between examples and engineering evaluation, supported by theoretical background. Thesis gives detailed introduction to the properly selected inputs for flow measurement. Thesis gives good description of the specific instrumentation focusing on airflow speed measurement by sensing pressure. The working part is good definition of the design and strength analysis of the Pitot type probe installed in the engine inlet channel of the aircraft. Finally thesis provides stress evaluation on the probe and adjacent surface based on example (defining methodology).	

Splnění zadání (Fulfillment of the assignment)	splněno
<i>Posuďte, zda předložená závěrečná práce splňuje zadání. V komentáři případně uveďte body zadání, které nebyly zcela splněny, nebo zda je práce oproti zadání rozšířena. Nebylo-li zadání zcela splněno, pokuste se posoudit závažnost, dopady a případně i příčiny jednotlivých nedostatků. (Assess whether the submitted final thesis meets the assignment. In the comment, please specify the points of entry that have not been fully fulfilled or whether the work is extended compared to the entry. If the assignment has not been fully met, try to assess the severity, impact, and, if appropriate, the causes of the individual deficiencies).</i>	
The fulfillment of the assignment is met. Theoretical principles were reviewed for signal sensing. The examples were shown to detect speed based on pressure. Adequate simplified model was provided as example for the analysis of the instrumentation hardware as example exposed to chosen load factors. It is adequate methodology and good start for further stress analysis with more sophisticated loads applied.	

Zvolený postup řešení (Selected solution procedure)	vynikající
<i>Posuďte, zda student zvolil správný postup nebo metody řešení. (Assess whether the student has chosen the correct procedure or method of solution.)</i>	
The author of thesis progressed systematically towards definition of hardware analysis from theoretical background of flow principles, through measurement process on examples till the final mechanical evaluation of probe under selected conditions. Proper assumptions and approach examples for compressible fluids, non-compressible fluids and ideal gas approach considering air speed. Good theoretical introduction and background. Very good theoretical description of the measurement of speed of aircraft from airflow references with examples. Very good description of devices and way of speed detection based on aerospace examples. The analytical way is properly set and evaluated. The methodology for simplified model analysis is properly described. Hence very well analyzed subject of probe.	

Odborná úroveň (Professional level)	A - výborně
<i>Posuďte úroveň odbornosti závěrečné práce, využití znalostí získaných studiem a z odborné literatury, využití podkladů a dat získaných z praxe. (Assess the level of expertise of the final thesis, the use of the knowledge gained from the study and the specialized literature, the use of the data and the data obtained from the practice).</i>	

The work and the way it is presented is of a professional level. The content is based on detailed study and understanding of professional examples. The theoretical study is adequate to let proceed with further work presented in next chapters. Assumptions, calculations and the way of results presented had been properly set for mechanical stress analysis of assumed simplified model of probe.

Formální a jazyková úroveň, rozsah práce (Formal and language level, scope of work), A - výborně

Posuďte správnost používání formálních zápisů obsažených v práci. Posuďte typografickou a jazykovou stránku. (Assess the correct use of formal entries contained in the work. Assess the typographic and language page.)

The work structure is clear. The literature references are properly selected and adequate. Results oriented calculation and analytical portion is very comprehensible and legible. Tables, graphics and visual presentation of details is at adequate level. The scope of work is wide and the calculations and analytical part is properly described. Provided good balance between description, referred equations used and the way of results presentation.

Výběr zdrojů, korektnost citací (Source Selection, Correct Quotation) A - výborně

Vyjáďte se k aktivitě studenta při získávání a využívání studijních materiálů k řešení závěrečné práce. Charakterizujte výběr pramenů. Posuďte, zda student využil všechny relevantní zdroje. Ověřte, zda jsou všechny převzaté prvky řádně odlišeny od vlastních výsledků a úvah, zda nedošlo k porušení citační etiky a zda jsou bibliografické citace úplné a v souladu s citačními zvyklostmi a normami. (Explain to the student's activity in acquiring and using study materials to solve the final work. Characterize the choice of sources. Assess whether the student has used all the relevant resources. Verify that all elements taken over are properly distinguished from their own results and considerations, whether violation of citation ethics has occurred and whether bibliographic quotes are complete and in accordance with citation habits and standards.)

Thesis provides reference to adequate public domain source selection. Sources used are correctly and appropriately quoted and used in the work. It is based not only on domestic literature but also on foreign positions and sources like pilots guide, what makes the advantage of the thesis. Thesis is also referring to the Technical standards for details used in adequate way as well as CVUT work related to FTB development.

Další komentáře a hodnocení (More comments and ratings) A - výborně

Vyjáďte se k úrovni dosažených hlavních výsledků závěrečné práce, např. k úrovni teoretických výsledků, nebo k úrovni a funkčnosti technického nebo programového vytvořeného řešení, publikačním výstupům, experimentální zručnosti apod. (Explain to the level of the main results of the final thesis, eg to the level of the theoretical results, or to the level and functionality of the technical or program-generated solution, publication outputs, experimental skills,)

Thesis provides good understanding of problem of airspeed sensing from flow pressures measurement. Gives good review of flow velocity gages examples and functional aspects. Design and strength analysis of the Pitot probe example installed in the inlet duct of the aircraft engine is good background towards possible factors influencing speed or pressure measurement uncertainty in real testing (as only similar hardware is applied and can bend). Thesis also evaluates time limitation for measurement probe, what is often neglected on academic level.

III. CELKOVÉ HODNOCENÍ, OTÁZKY K OBHAJOBĚ, NÁVRH KLASIFIKACE (TOTAL EVALUATION, QUESTIONNAIRE, DRAFT CLASSIFICATION)

Shrňte aspekty závěrečné práce, které nejvíce ovlivnily Vaše celkové hodnocení. Uvedte případné otázky, které by měl student zodpovědět při obhajobě závěrečné práce před komisí.

Summarize the aspects of the final work that most affected your overall assessment.

The work and the selected process used leading to thesis results is considered to be beneficial. It is based on proper theoretical support, adequate study of the existing solutions for thesis object of and study of inputs and methods that could be used for analysis and the selected process. Methodology steps are properly defined to show the progress of the work from theoretical part to final results. Calculations and analysis is properly presented and results are visualized. Worked out methodology therefore leading to final results is properly selected from literature.

Please indicate any questions the student should answer in defense of the final thesis before the commission.

1. What is the difference between described by you type of devices (low air speed) and the supersonic?
2. What can be the penalty on the engine or compressor in case of not properly measured/confirmed airspeed or pressure in the inlet channel?
3. Stated in thesis that the beam was loaded for simplicity only in one plane (4.1. Chapter, page 42), but what can be other forces (mechanical and aerodynamic) than can be applied for the 3D model analysis (5.1. Chapter)?
4. What aerodynamic loads can be the source of HCF stress applied on the 3D model analysis (5.1. Chapter)?
5. What can be the source of probe resonance and why to be taken into account at design stage?

Předloženou závěrečnou práci hodnotím klasifikačním stupněm **A - výborně**.

present the submitted final thesis by selecting the grade.

The submitted final thesis evaluates classification grade **A - excellent**.

Datum: 21.8.2018

Podpis: Andrzej Ćwik

