CZECH TECHNICAL UNIVERSITY IN PRAGUE
Faculty of Civil Engineering
Department of Science and Research
Thákurova 7, 166 29 Praha 6

e–mail: obhajoby@fsv.cvut.cz tel.: 224 358 736

Opponent's review of the Doctoral Thesis

Candidate Ing. Jiří Stodůlka

Title of the doctoral thesis Analytical and Computational Methods for Transonic Flow Analysis and Design

Branch of study Thermomechanics and Fluid Mechanics (Faculty of Mechanical Eng of CTU)

Tutor prof. Ing. Pavel Šafařík, CSc, prof. Dr. Helmut Sobieczky

Opponent prof. Dr. Ing. Václav Matoušek

e-mail v.matousek@fsv.cvut.cz

Topicality of the doctoral thesis theme

Commentary: Transonic flow is a complex fluid-mechanics phenomenon combining difficulties associated with fluid compressibility and different conditions in subsonic and supersonic regimes. This makes computation of transonic flows for design purposes a challenging problem. The idea exploited in the thesis of a mutual comparison and merging of different analytical and computation approaches into methods combining a sound analytical background with an efficient numerical solution merits attention and a PhD project is certainly an appropriate carrier for such a research.

☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Fulfilment of the doctoral thesis objectives

Commentary: The candidate formulated his thesis goals very clearly in 5 distictive items (p. 32) and directed his work efficiently throughout the chapters of the thesis to fulfill each of them. At the end it can be concluded that he was successful in meeting his research objectives although the reviewer feels that it would be better if some of them were formulated less generally. Then the measure of the fulfillment of those more specific goals would be easier to access.

☐ excellent	☐ above average	☒ average	☐ below average	☐ poor

Research methods and procedures

Commentary: The state-of-the-arts review is concise, covering the main relevant theories and studies. The methods and procedures are selected appropriately and well described. The reviewer appreciates the broad range of different approaches (classical, CFD) taken into account in the research analysis.

☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Results of the doctoral thesis – dissertant's concrete achievements

Commentary: The proposed procedures combining the clasical analytical approaches and the modern computational approaches to flow analysis and design pose an original contribution to the research field and it is of a quality as to merit publication in a reputable journal indexed in the Web of Science. A collection of additional experimental validation cases is recommended for the sake of candidate's work publication.

☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Importance for practice and for development within a branch of science

Commentary: Despite considerable efforts devoted by the candidate to the support of his crucial statement in the thesis, there still seem to be some small pieces missing in the line of reasoning as to whether or not it is beneficial for practice to include the classical methods in routine analyses and designs for transonic flows. To make his statement more convincing, the candidate should discuss the issue in more details including more demonstrations of existing and potential practical applications and/or including explanations of the lack of such applications in practice. This might be something to discuss in the oral defence.

☐ excellent	☐ above average	☒ average	☐ below average	☐ poor

Formal layout of the doctoral thesis and the level of language used

Commentary: The thesis is logically structured and organized. The text reads well and contains all required information at right places for further reading throughout the thesis. The level of the written English is very good and a number of typos acceptable.

☐ excellent	☒ above average	☐ average	☐ below average	☐ poor

Remarks

A discussion of the effect of viscosity might deserve more attention in the thesis. The studied flow cases are solved as inviscid flows and a brief explanation is given to justify the assumption. However, a more detailed discussion would reveal if any of the studied cases is more prone to viscous effects than the others and/or under which conditions the viscosity should not be neglected.

Final assessment of the doctoral thesis

This is a very good thesis, strong in handling and exploiting various analytical, theoretical, and numerical approaches in complex cases of compressible transonic flows.

Following a successful defence of the doctoral thesis I recommend the granting of the Ph.D. degree

yes ☒	***no*** ☐

Date: 9 April 2019

Opponent's signature: .....