REVIEW

of dissertation work for the acquisition of educational and scientific degree "doctor"

Author of the dissertation work – M.Sc. Georgi Petev Georgiev
Dissertation topic - "Research for the realization of personal aviation transport"
Reviewer - Prof. Dr. Ognian Stoykov Stoykov

1. Reason for writing the review

This review was written in a decision of the execution of the Scientific Jury, appointed by order 166 / 05.12.2019. of the Director of SRTI-BAS and pursuant to Art. 4 of ZRASRB, Art. 30 of the Regulations for its implementation and Art. 6 of the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at BAS and Decision of the Scientific Council of SRTI-BAS (Protocol 7 of 29. I I .2019).
The dissertation submitted to me for review is 137 pages and contains 57 figures, 25 tables and 115 cited titles.

2. Submitted materials

- Dissertation and abstract.

The presented dissertation is structured in Introduction, Chapter 4, Conclusion, Author reference with scientific, applied and applied contributions, List of publications and dissertation reports and citations. The work is very well shaped, most of the figures are colored, which well illustrates and complements the text. The attached List of abbreviations in English with English and Bulgarian meanings facilitates the comprehension of the text.

3. The relevance of the problem developed in the dissertation in scientific and scientific terms.

At present, congestion in large cities is very high due to the movement of hundreds of thousands of cars. With the development of technology, the need to ease traffic and reduce travel time, the concept of flying taxis is up to date. Two ideas are currently being developed. The first is the creation of unmanned aerial vehicles (passenger drones) with propulsion similar to that of small remote-controlled vehicles. The second is the production of flying cars. Companies such as Airbus, Boeing, Bell, Uber have a strong investment interest in creating passenger drones that will be realized in the coming years. The first successful test flight was

made in 2019 by Boeing. The unmanned aerial vehicle is powered entirely by electric motors and can take off and land vertically. Has one propeller for horizontal flight and eight more for hanging.
Airbus presented the prototype of a passenger drone in March 2019. It has four pairs of electric propellers built on duct air technology and can carry up to four people and one pilot. The European concern made a demonstration flight with the machine.
In order to realize the first idea, it is necessary to solve regulatory and infrastructure problems. Creating take-off and landing sites for personal aircraft will require much more time, money and space than those for shared flights. Another problem is the regulatory one, as the possibility of such aircraft being used in large settlements or for long-distance transport is being explored. The legal framework is either missing or insufficient. For the sake of certification, drones will be piloted for the first time, and subsequently able to become fully autonomous.
The topic of the dissertation is important, relevant and of great practical importance. The urgency is to ensure efficient mobility in urban areas. Urban aviation mobility is an innovative solution to urban transport problems. A methodology for the integration of urban aviation mobility into an existing urban environment and the structure of the Urban Aviation Mobility System are proposed. Flight simulations were performed on different city routes.

4. Degree of knowledge of the state of the problem and creative interpretation of the literary material.

In the dissertation presented, the doctoral student cited a bibliography from 115 sources that he used to evaluate the state of the scientific problem and develop the topic.
The PhD student has shown opportunities for creative interpretation of literary sources. He used the same to formulate the purpose and tasks of his dissertation and research methods. He has done very well on this indicator.

5. Matching of the chosen research methodology with the stated purpose and tasks of the dissertation.

The goal that the doctoral student set for research on the basic requirements, the feasibility and stages of development of urban aviation mobility and the development of a methodology for building an aviation mobility system in populated areas have led to concrete results.
I believe that the models created and the chosen sequence of research are appropriate and

allow the goal of the dissertation to be achieved.

6. Characterization of nature and evaluation of material reliability. on which the contributions of the dissertation are built.

The dissertation is developed at IKIT-BAS. The research was done at the same institute.
All work publications have been reported and published in scientific journals in the Republic of Germany and the Republic of Bulgaria.

7. Scientific and applied scientific contributions of the dissertation.

The dissertation contains scientific and applied scientific results which represent a contribution to science. The applicant has a thorough theoretical knowledge of the specialty and the capacity for independent research.
The paper presents scientific contributions - 2, scientifically applied contributions - 3, applied contributions - 5.
I accept the following contributions in the dissertation:

Scientific contributions:

- A Foresight Analysis Methodology was proposed for planning in the initial phase of urban aviation mobility deployment for a particular settlement; A methodology for integrating urban aviation mobility is proposed.

Scientific and applied contributions:

- the structure of the Urban Aviation Mobility System has been drawn up;
- flight simulations were performed on different city routes;
- Initial requirements for the design and construction of a technological demonstrator of an unmanned aerial vehicle (copter) and of an aircraft for urban aviation mobility are derived and formulated; requirements are proposed for the adaptation and modification of the urban environment and the architecture of the buildings to introduce their integration into urban aviation mobility;
- financial cost analyzes of urban aviation mobility costs have been carried out,

8. Degree of the dissertation's personal participation in the contributions.

From the way of presenting the material in the dissertation and the approach in formulating the problems related to the topic and the results obtained, I believe that the researches carried out, writing the dissertation and contributing to it are his own business.

9. Evaluation of dissertation publications.

The main results of the dissertation are reflected in 29 publications, 15 of which are independent, in three publications the authors are two, and in the other four.

The publications reflect the nature of the research described in the dissertation and the results obtained.

10. Using the results of the dissertation work in scientific and social practice.

I have no knowledge of using or quoting research data in dissertation work from other authors. The research carried out at SRTI-BAS is a prerequisite for using the results obtained by Bulgarian and German scientists.

11. Conformity of the abstract with the requirements for its preparation and adequacy of reflecting the basic positions and contributions of the dissertation.

The abstract of the dissertation in a volume of 50 pages, 9 figures and 11 tables is shaped according to the requirements and reflects the goal, the tasks accomplished, the results achieved and the scientific and applied scientific contributions.

12. Opinions, recommendations and notes.

The thesis has no fundamental errors in formulating the idea and the realization. It is structured very well, it sets the goal and the necessary tasks that solve it. to the dissertation I have the following notes:

1. On the design:

- a number of sentences (passages) are not grammatically well defined;
- the term “curvilinear rights” - 10 pages is incorrectly introduced;
- in a few places a figure is written and a table is given below, for example p.29;
- on page 56 two large passages are repeated;

2. Content:

- no mathematical apparatus has been presented, but studies and simulations using one have been carried out;
- in Chapter **II**, **11.1 Foresight Feasibility Analysis of Urban Aviation Mobility**, a

methodology is presented for this analysis, research structure, implementation requirements and implementation activities. Forsyth analysis is not observed. It is partly written, but in other chapters. The stages of the Forsythe are known - developing, implementing, updating, preparing and attracting participants. Foresight analysis is the use of a complex system of expert opinion methods, SWOT analysis, scenario building, roadmaps, relevance tree, peer impact analysis and more. The choice of methods depends on the budget, the availability of qualified experts, the availability of the necessary infrastructure and, as a rule, their number is 5-6.

13. Conclusion

The quality of the dissertation work meets the requirements of the ZRASRB and the Rules for the implementation of the ZRASRB. The dissertation shows that the dissertation holder possesses deep theoretical knowledge and professional skills in the scientific specialty "Dynamics, ballistics and flight control of aircraft", qualities and skills for conducting research completed with scientific and applied scientific contributions. I give a positive assessment of the thesis.

I suggest that the members of the scientific jury award the educational and scientific degree "Doctor" to M.Sc. Georgi Petev Georgiev in the scientific specialty "Dynamics, ballistics and flight control of aircraft".

January 11. 2020 Reviewer:

Prof. Dr. Stoykov