

REVIEW

of dissertation work for the award of educational and scientific degree

"Doctor" on the topic "STUDIES FOR THE IMPLEMENTATION OF PERSONAL AIR TRANSPORT IN URBAN ENVIRONMENT" by M.Sc. Georgi Petev Georgiev in the field of higher education 5. Technical Sciences Professional Degree 5.5. "Transport, Shipping and Aviation", scientific specialty "Dynamics, ballistics and flight control of aircrafts"

Reviewer: Chl. Kor. Peter Stefanov Getsov - Institute for Space Research and Technology, BAS.

The review was written in pursuance of a decision of the Scientific Jury appointed by order NQ 166 / 05.12.2019. of the Director of ICIT-BAS and Protocol NQ 1 / 18.12.2019. from a meeting of a scientific jury.

1. Short biographical data for the doctoral student

Georgi Petev Georgiev was born on 22.01.1987 in Haskovo.

He holds a Master's Degree in Urban Planning, obtained by RWTH Aachen University, Germany

Since 2013 he has been working at the Fraunhofer Institute, Germany.

He has been appointed Bulgaria's representative in the Urban Aviation Mobility Airbus initiative.

According to the provided statement, it is evident that the candidate for educational-scientific degree (ONS) meets Art. 2-6 of the Law on the Development of the Academic Staff of the Republic of Bulgaria (ZRAASB) for the fulfillment of the minimum national requirements for acquiring a Doctoral degree in the field of 5. Technical sciences and the requirements of the credit system of BAS in preparing doctoral students.

2. Submitted materials

The dissertation includes: an introduction, four chapters and a conclusion, a total of 137 pages, 57 figures and 25 tables. 115 literary and other sources were used. Lists of publications and dissertation reports and citations are also presented, as well as authors' recounting the scientific and applied contributions. The work is carefully crafted and precise, with most of the figures and diagrams being colored and well in line with the text. The list of abbreviations

in English presented at the outset is in line with the aviation and other systems adopted and greatly facilitates reading and understanding of the work.

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

Continuous population growth, especially in large cities, requires a new approach to urban transport. The use of drones is one of the modern solutions for achieving sustainable mobility, reducing traffic problems, using the third dimension in space without the need for traditional terrestrial infrastructure.

Based on what has been said, the object and purpose of the research of the dissertation are extremely relevant.

The same can be said about the proposed methodology and the tasks that have been solved to build an aviation mobility system in large settlements, including:

- analysis of the state of urban mobility;
- Foresight analysis and assessment of the feasibility of the urban mobility system;
- model and stages for the implementation of the system;
- determining the initial requirements for the system and the stages for its implementation; development of methodology for the implementation of the system and its testing for specific populated areas, as well as conducting simulation studies;
- study of the environmental, social and economic efficiency of the development of the system.

Implemented in the work is extremely important for the development of aviation mobility systems and is a key challenge for their future development.

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

The conducted analysis and the literary review of the state of urban transport, as well as the researches and the obtained results of unmanned aviation systems for urban mobility show that the doctoral student is able to find and analyze the information from the literary sources well and to use it to solve the defined work objective. and tasks. He is very knowledgeable about the status of the problem and applies creative and original solutions to the creation of methodology, methodology and simulation models of flights in Ingolstadt and Plovdiv.

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

The purpose of the thesis of the magician. Georgiev is to carry out research to determine the basic requirements, the possibilities for implementation and the stages of development, proposing a methodology for building an aviation mobility system in populated regions. The doctoral student successfully applies the systematic approach that underlies the study of the system, consisting of relatively separate subsystems (system of systems). The research process is accomplished by solving a number of interrelated tasks, which significantly facilitates the development and allows to determine the main stages of creation of an unmanned aviation system for the needs of urban transport.

The methodology and methodologies for research and application of the unmanned aerial system proposed and used on this basis are in accordance with the stated purpose and tasks of the dissertation.

6. Brief analytical characterization of the nature and assessment of the reliability of the material on which the contributions of the dissertation are built

In Chapter 1, the author analyzes in detail and very competently the state of the problem, having previously defined the basic requirements and assignments of unmanned aerial urban mobility systems. Based on the main characteristics and parameters of the power supply, it offers an original classification, taking into account the relationship between these parameters. The paper defines the main tasks in the research and design of the unmanned aeronautical system and defines their peculiarities. The types of urban transport are analyzed in detail and the advantages of the studied system are determined.

The great interest of the business, the municipal and political stakeholders of the EU and the common European Aviation Urban Mobility Initiative launched by the European Innovative Partnership for Intelligent Cities and Municipalities have been shown and the factors behind the creation of this initiative have been analyzed. The issue of the seamless integration of the unmanned aviation transport system in the existing urban transport systems is also considered. Chapter 2 presents an idealized model of the aviation mobility system, taking into account the subsystems of the proposed integration project and the requirements for urban integration. A detailed literature review and classification of the system components and their technical characteristics were also made. Based on a specific business model, the cost of flight and development is determined over time.

Issues related to the urban environment and ensuring the safety of flights and residents of cities over which aviation is carried out are considered.

The legal framework treating the structure of the territories, urban and regional spatial

planning and development consisting of laws, norms, development plans, strategies, road maps and agreements in the light of the single European airspace and integrated air transport has been systematized. is dedicated to applying Forsyth analysis as a building block for strategic planning in the creation of unmanned aerial transportation systems.

Chapter 3 elaborates the methodology for integrating aviation mobility in an urban environment. The state of the aviation mobility subsystems presented by some known countries and companies related to different cities and regions has been evaluated.

The peculiarities of the integration of aviation unmanned transport systems through an interface providing the automation and coordination of air transport and security control are also considered. Possible corridors or areas for UAV flights are identified and the parameters that determine the case are examined.

Atmospheric conditions, the risks of collision with birds, etc. are also taken into account. to obtain an accurate assessment of ground facilities, navigation, air traffic management and the definition of the necessary legislation over cities and regions served by unmanned aeronautical transport systems and systems.

An essential part of this chapter is the methodology for integrating aviation mobility in an urban environment, which outlines the responsibilities of the coordination center and the possible solutions for integrating unmanned transport systems in the context of this center. A matrix has also been developed to evaluate the suitability of the urban environment and the building stock, as elements of the system of systems.

In Chapter 4, the doctoral student presented the research and the results of simulation modeling of the methodology for integrating urban aviation unmanned aerial systems.

Verification and validation were carried out using the method of expert evaluation on the basis of a research interview covering both the factual and the semantic level.

Simulation studies have been conducted for the cities of Ingolstadt and

Plovdiv for specific routes and a comparative analysis of carbon emissions for different vehicles has been made. Four work packages have been identified to alleviate congestion in the city of Plovdiv and proposed deadlines for phased implementation in four phases. Initial requirements for the development of a technology demonstrator are outlined and formulated.

7. Scientific and applied contributions of the dissertation

The contributions to the dissertation are scientifically applied and applied in nature and are essential for the enrichment of the theory and practice of the study, systematization and development of aeronautical unmanned transport systems and can be used to improve all

activities related to the research, design and testing of these systems.

I acknowledge the contributions made by the doctoral student. In my opinion, however, as I noted above, the contributions related to analytical proof by formulas and equations, etc., are not fully shown. analysis and synthesis of unmanned aerial transportation systems. The results of the scientific research carried out in the process of their presentation and the description of their operation, which I can only explain to myself with the large scope of the dissertation, where much of the research, tests and results are not presented.

as I have already noted the innovative suggestions and merits of the magician. In developing various projects for the creation of modern urban transport in the so-called smart cities, Georgiev is indisputable, which makes it difficult to evaluate his dissertation and define it as good and useful.

8. Assessment of the degree of personal participation of the dissertation student in the contributions

I personally know the doctoral student and considering the results of the submitted work, as well as the discussions with the dissertation conducted with him, I consider that the contributions are his own matter and are essential in the field of theory and practice for the creation of aviation unmanned transport systems.

9. Evaluation of dissertation publications

The PhD student has 29 papers at national and international conferences and articles in prominent thematic journals. The works are closely related to the dissertation and 15 of them are independent. No facts were provided about citations to the PhD student's work.

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

The dissertation enables the interested departments, enterprises, scientific institutes and private companies working in the field of unmanned aerial transportation systems and related technologies, as well as to use the obtained results. The methodology, methodologies, models, etc. developed by the doctoral student. in fact, the wealthy are likely to have an economic effect, but so far they have not been confirmed by documents showing their importance, but only shown examples of individual countries and companies.

11. Evaluation of the abstract

The abstract of the dissertation reflects essentially the works and researches carried out and shows the obtained results. The main points and contributions of the dissertation are reflected in an adequate and plausible way.

12. Opinions, recommendations and notes

The dissertation proposed for review is a complete and fulfilled scientific work.

Much space and time, however, is devoted to presenting the different types of unmanned aerial transportation systems and their experienced application, which, in my opinion, was unnecessary provided the topic was dedicated to their research and implementation.

The proposed materials do not show to what extent and on the basis of what criteria and evaluations and comparisons the proposed methodology and models appear to be optimal and unique for the particular proposed options. I encourage the doctoral student to continue research into unmanned aerial transportation systems and to do what is necessary to promote and use the results and devices obtained.

13. Conclusion

The results obtained in the dissertation represent an original contribution and show that the doctoral student has in-depth theoretical knowledge and practical skills in the subject. I give a positive assessment of the dissertation on "RESEARCH FOR IMPLEMENTATION OF PERSONAL AIR TRANSPORT IN THE CITY ENVIRONMENT "of **M.Sc. Georgi Petev Georgiev** and I propose to the Scientific Jury that he be selected as a " doctor "in the specified specialty.

11/10/2020

Sofia

Reviewer:

/ Chl. Kor. P. Getsov /