Review of: "Numerical Simulation and Computational Fluid Dynamics Analysis of Two-Dimensional Lid-Driven Cavity Flow Within the Weapon Bay of an Autonomous Fighter Drone"

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Potential competing interests: No potential competing interests to declare.

Any successful experience in the application of computational fluid dynamics technologies is important, so the reviewed paper can be considered as relevant in both theoretical and applied aspects.

Comments on the paper text and content are given below:

1. The title of this paper and the general motivation of the research conducted are aimed at studying complex high-speed flow dynamics and optimizing the design of the weapon bay of autonomous drone fighters for military applications. The introduction presents many practically important examples of the effective use of computational fluid dynamics for various applied problems, including military applications, such as the missile chamber of fighter jets, but the problem solved in the paper is not formulated and unformalized. In essence, the authors successfully apply the multigrid approach to two-dimensional classical flow in a square cavern with a movable cover, using equations in transformed stream function-vorticity variables, but in the paper abstract it is declared that “we present a comprehensive numerical simulation and computational fluid dynamics (CFD) analysis of the THREE-dimensional drone lid-driven cavity flow within the weapon bay of an autonomous fighter." But why exactly the square cavity is identified with the weapon bay of autonomous fighter drones - it is difficult for me to understand. Moreover, it seems to me that in reality such a weapon bay should have spatial geometry and the ability to model it with a two-dimensional approximation should be justified by schematic illustrations of the object of study and a number of correct assumptions, which is not in the paper. Thus, the application of the study of flow in a square cavity to "autonomous fighter drones for military applications" looks very doubtful and I strongly recommend adding at least a schematic illustration of the weapon bay of autonomous fighter drones with corresponding explanations in the paper text for a better understanding of the problem being studied by readers of the paper.
2. The paper declares high-speed flow and Reynolds numbers, calculated from the length of the side of the cavern L = 1m, up to 10000. However, the speed of the cavity lid won’t exceed 0.15 m/s, which clearly does not fit with the condition of high-speed flow… High speeds require appropriate taking into account the effects of compressibility, which is impossible or, at least, is very difficult to implement, when using stream function-vorticity variables, not to mention the fact that this method is very restrictive in computationally efficient application for high Reynolds numbers.
3. I am not sure that the well-known typical form of 3D Navier-Stokes equations (7) in the primitive variables is really

needed in this paper if the used equations (also well-known) are (8, 9).

4. If high flow velocities are one of the priorities in the paper, why are the equations written for laminar flow? At high speeds, turbulence is an inevitable factor that can have a strong impact on the flow parameters and must be taken into account by an appropriate model, or it must be explained why the flow in the weapon bay will be laminar.
5. I am not sure that the performance of the NVIDIA® GeForce RTX™ 3070 Ti graphics card is important for the method used and the results obtained (no graphics computing technologies like CUDA are used here), so the mention of the graphics card (page 7) should be removed.

The list of references (46 sources), the style of presenting the results, and the structure of the paper seem appropriate.

The paper generally corresponds to the profile of the Qeios journal, however, I am not sure that publications on the improvement of weapons and military technologies development comply with the ethical standards of the journal. Considering this circumstance, as well as the absence in the paper of a direct connection between the research results and the “weapon bay of autonomous drone fighters for military applications”, I strongly recommend that the authors change the title and find a more universal object for applying their computational results.

Thus, based on the above characteristics and comments, I consider it possible to publish this paper in the Qeios journal after correcting the above-mentioned shortcomings.