Invention Disclosure Form

This form is necessary to start the patent application process and can be completed by anyone who understands the idea/invention. Please attach additional sheets, documents or other materials as needed to respond to the questions below.

1) **Please give a brief descriptive title to the invention (usually 3-20 words).**

   Bio-Inspired Whale Flipper Controlled low powered Rocket for Agile Flight Maneuvering

2) **Briefly describe the problem(s) which your invention solves.**

   Traditional fin-based rocket control systems are prone to aerodynamic stall and instability at low thrust levels and high angles of attack, making them less effective for low-power rocketry. There is a need for a more stable, efficient, and stall-resistant control mechanism for rockets operating at lower speeds and altitudes.

3) **Please describe the idea/invention briefly. If possible, attach a sketch, drawing, photograph, computer program listing or any other materials that would assist in the understanding of the invention. A more thorough description of the invention will be needed to complete a patent application if that option is chosen by the inventor. Ideas must be fully formed enough to implement them in a straightforward way without significant experimentation. Please highlight any aspects of your invention you believe are important to understanding the invention, including those aspects addressing a previously unrecognized or incompletely understood problem. Please include at least a brief one sentence description of each figures that you include.**

   The invention presents a novel rocket control system that uses bio-inspired fins based on whale flipper morphology, featuring leading-edge tubercles. These specialized fins create vortex patterns that delay stall, improve lift, and enhance stability at low speeds. The rocket integrates independently actuated fins, controlled by servos, enabling precise pitch, yaw, and roll control. The design is particularly suitable for low-power experimental rockets, offering better energy efficiency and tighter turn radii without relying on complex thrust vectoring.

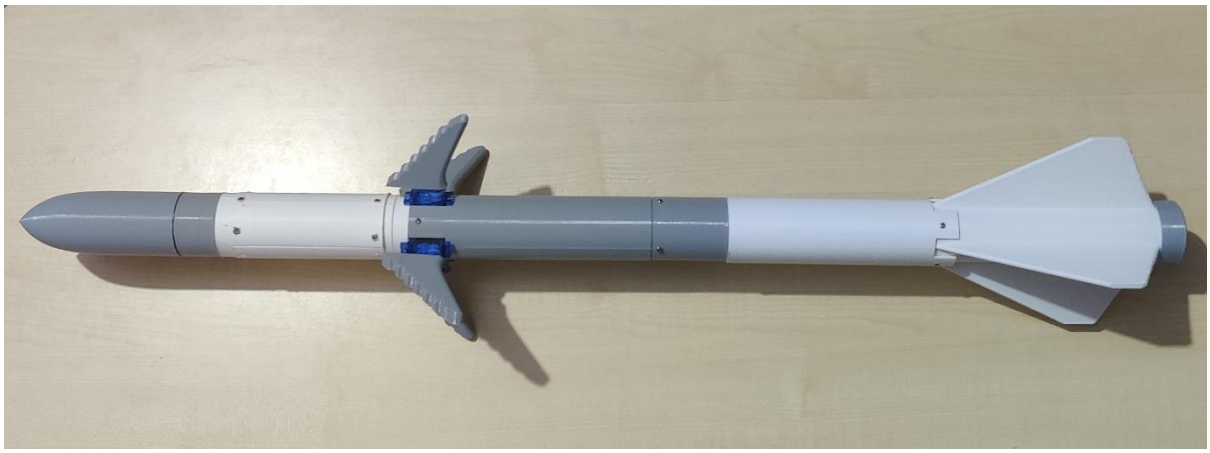

Fig1: Assembled prototype of a bio-inspired whale flipper fin-controlled rocket designed for low-power aerodynamic testing.

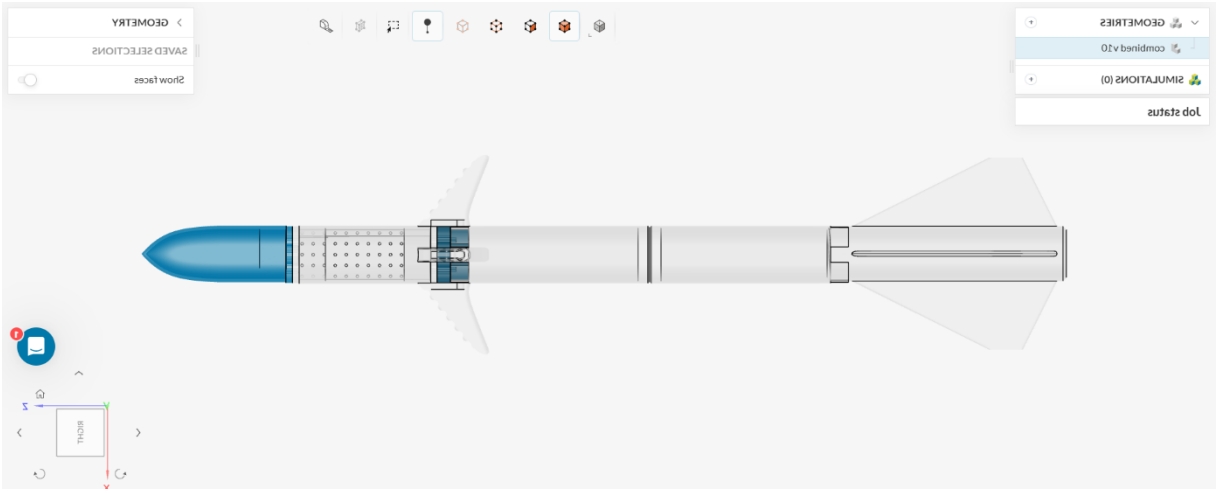

Fig2: CAD representation of the rocket structure showing modular segments and fin placement for precision control.

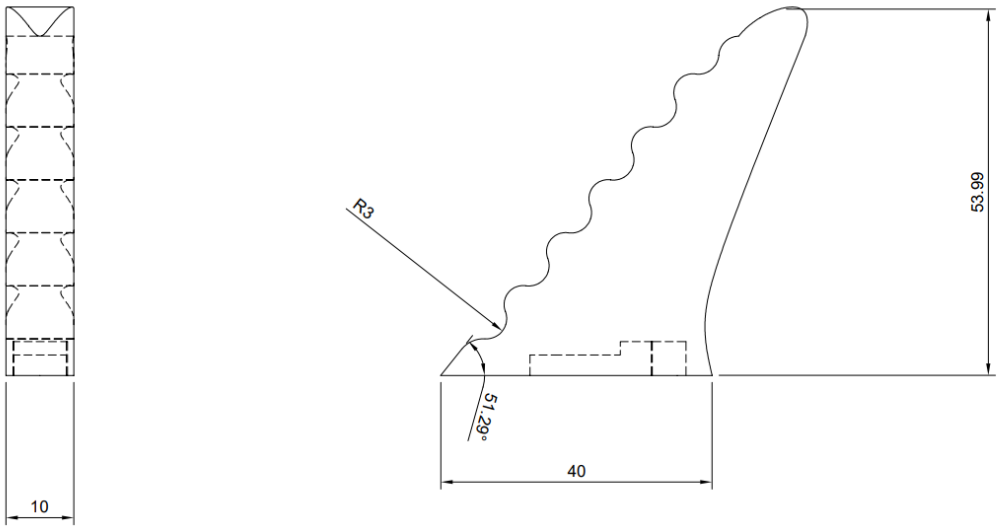

Fig3: Technical drawing of the whale flipper-inspired fin featuring leading-edge tubercles for enhanced aerodynamic performance.

4) **What are the most relevant previous approaches/solutions you know of which address or attempt to solve the problem(s) your idea/invention solves?**

Conventional active fin systems with flat fins, thrust vectoring nozzles, and aerodynamic spin stabilization methods.

5) **Please specify the key differences between the idea/invention and the most relevant prior approaches known to the inventors. What specific advantages does the idea/invention provide over the prior approaches? Some such advantages are: improved performance, reduced cost, reduction of maintenance, a new feature or a new functionality.**

- Uses leading-edge tubercles for improved airflow and delayed stall.
- Works effectively at low Reynolds numbers, ideal for low-power rockets.
- Smaller turn radius and higher lift-to-drag ratio.
- No reliance on high-thrust vectoring.
- Energy-efficient and precise, even at low thrust.

6) **When was the idea/invention first conceived?**

21th march 2025

7) **Has this invention been reduced to practice, i.e., embodied in an actual structure or actually used within the intended environment? If so, give date of first actual reduction to practice.**

Yes. CFD simulations have been conducted, and prototype-level model have been made

8) **Has this invention been disclosed to anyone else whether or not under a non-disclosure agreement. If so, provide details of such disclosure(s).**

No

9) **Is this invention included or to be included in any product or service? If so, identify the product or service, and state the date the invention was first included in the product or service.**

No commercial product yet.

10) **Is the invention the subject of any publication, such as a technical article or journal paper? If so, please attach a copy of the publication.**

No formal publication yet.

11) **Has the invention been "offered for sale" – i.e. has the invention been included within any product or service offering presented to a customer for evaluation or purchase, whether or not the product or service offering represents a fully developed or commercially available product or service? If so, state the first date of such offer for sale.**

No.

12) **What commercial value do you see in the invention? What are the commercial applications? What competitive advantage do you think this invention provides? What is the likely competitive interest in the invention?**

This invention has strong application in educational, research, and small-scale aerospace testing platforms. It offers competitive advantages in stability, efficiency, and maneuverability, particularly in environments where conventional high-power systems are not feasible.

13) What are the results and advantages of using your invention?

- Enhanced aerodynamic control at low speeds
- Stable maneuvering with reduced stall risk
- Suited for portable, lightweight rocket platforms
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14) Mention the technical effects of the invention.

- Vortex generation stabilizes flow
- Improved control responsiveness at low thrust
- High lift-to-drag ratio at moderate angles of attack
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15) Please provide details regarding utility of the invention (indicate possible application area(s) of the invention)

- Educational model rockets
- Experimental low-power sounding rockets
- Aerospace biomimicry research platforms

16) Please provide details regarding experimental results if any.

CFD simulations show improved lift, reduced stall, and smoother airflow over the fin surface using whale flipper-inspired tubercles. Velocity plots and streamlines indicate strong vortex retention and boundary layer control

17) Please provide name, address, and nationality details of all the inventors.

1. INVENTOR(S):

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