

11 - Pentefoiling

Modern air and wind sports fulfill the human dream of bird-like flight, blending speed with a sense of freedom and nature. However, these sports often show an inverse correlation between safety and the level of perceived thrill. Wingsuit flying is a highly exhilarating but dangerous sport at the same time, with a 1.7% annual mortality rate. Out of all BASE jump sports, 61% of recent fatal accidents involve wingsuits. Conversely, paragliding is safer, with a 0.05% mortality rate, and is easier to learn - it requires few days of training compared to 250+ skydives for even taking up wingsuiting. However, it lacks the excitement due to the lower achievable speeds and a less direct wing connection. This project introduces the concept of PenteFoil, a system combining stability and safety on par with a paraglider with the thrill of a wingsuit. This is achieved by attaching an inflatable wing directly to the pilot, enhancing control, reducing sink rate, and enabling running take-off and landing without the use of a parachute, aiming to create a safe yet exhilarating flying experience.

Project Objective

The primary objective of this project is to design and develop an inflatable flying wing that can be easily transported and assembled. The wing must be foldable such that it can be stored in a backpack for easy transportation. This ensures the system can be deployed in a wide range of environments, making it more accessible to users. Additionally, its total weight should not exceed 25 kg to ensure it can be carried comfortably. The design should allow for quick and straightforward assembly, to allow a setup below 30 minutes. To make flying accessible to a large number of users, it should be easy to learn and provide a possibility to advance in the sport by incorporating complex control manoeuvres such as deep spiral, diving, or utilisation of thermal winds. Overall, the PenteFoil is brought to life in order to fill the market need for a safe and exciting air sport.

System Design

The PenteFoil is an inflatable, foldable, and easily transportable wing. The structure uses the principle of Tensairity to obtain a rigid inflatable structure, where the loads are carried mostly by strong compression and tension elements, and less by the inflated skin itself. The structure uses strong and lightweight materials such as nylon, Dyneema fabric, and CFRPs to minimise the weight. The aerodynamic shape of the wing ensures static and dynamic stabil-

ity, using an adjusted reflexed airfoil to forego the need of a horizontal tail. The control system mirrors the C.G. based control system seen in modern hang-gliders, providing effective control and increasing safety.

Unlike traditional hang gliders, the PenteFoil features foldable wingtips, which can be used for speed control as well as supplemental roll control.

