

## **Unmanned Aerial Vehicle (UAV) structural and manufacturing of conventional and humpback Tubercles Leading Edge (TLE) in aeronautical applications**

### **ABSTRACT**

The paper reviews the literature on tubercles as recent advance bio-inspired wing technology in the field of aeronautics. The purpose of this paper is to conceptually identify the work on tubercles, particularly for unmanned aerial vehicle (UAV) technology and thereby provide a delineation review and in-depth technological applications of biological systems interrelation with engineering. The paper discussed the evolution of conventional UAV wing with clean airfoil in terms of designs and mechanisms, materials and manufacturing processes, whereby all researches attributed these capabilities both in simulation and experimental studies. Tubercles, commonly known as protuberances of a Humpback whale pectoral flipper which found on the leading edge, offering performance enhancement in terms of aerodynamic perspective. Implementing tubercles design has proven its improvement on airfoil performance, effectively reduce noise and separation bubble size. Despite the present studies on aerodynamic performance, other crucial elements such as structural performance and manufacturability of the tubercles leading edge (TLE) wing should be taken into consideration for better lifting and maneuverability of UAVs. To date, there is insufficient reviews on the structural issues of TLE wing in-depth and provides comprehensive understanding regarding this topic. Hence, the purpose of this is mainly to demonstrate lineage of the TLE wing and current researches' trend. This discussion will pave the way of state-of-the-art research area on this optimum performance of wing particularly in terms of manufacturability perspectives.

**Keyword:** Unmanned Aerial Vehicle (UAV); Conventional wing; Structural analysis; Tubercles Leading Edge (TLE) wing