

ACKNOWLEDGMENT

The atmosphere in the Sri Lanka Air Force (SLAF) became my oasis of research into aviation since the year 2001 in which I embarked on a project with a small team of engineers to design and build an ultra-light aircraft. Then Director of Aeronautical Engineering Air Vice Marshal (retired) ODNL Perera offered his fullest support to the project by authorizing the use of human resource, materials and facilities available at the Aeronautical Engineering Wing (AEW) located at the SLAF Base, Katunayake, Sri Lanka. AVM Perera even authorized the use of 27 bhp SACHS- 350 engine fitted to Israeli built 'Super Scout' UAV to power the ultra-light. Wing Commander (retired) Varuna Senarathne who is now a Captain in Sri Lankan airlines was my co-partner in designing the ultra-light. My highest gratitude is expressed to the 13602 Sergeant Wijesuriya J who worked at the AEW as a specialized structural technician at the time, who built the ultra-light entirely by himself. Group Captain Mohan Balasuriya, Group Captain Udula Wijesinghe and Mr Viraj Fernando were close associates who provided their unconditional support in executing the project in its entirety.

The number of discussions, amount of thinking and dreaming about the methodology of crafting the intended product enticed me to observe everything I see in birds and in aircraft that creates the magic of aerodynamic lift. Renowned model aircraft builder in Sri Lanka Mr Viraj Fernando suggested using a 'Clark Y' wing profile to our ultra-light which he believed as one of the cleanest aero foils that produces a significant lift. We did not have access to any reliable methodology to check it on our own other than believing what Mr Viraj proposed trusting on his credentials. The 'Clark Y' profile was indeed easy to manufacture owing to its cambered upper surface and the flat bottom. Finally, the project 'Centenary X' was completed and it was successfully flown first time publicly by Wing Commander (retired) Varuna Senarathne on 17 Deember 2003 at the airfield, Sri Lanka Air Force Base, Ratmalana, during the celebrations held to mark the 100 years since the first powered flight by the Wright brothers in 1903.

The second air vehicle building project was started in the year 2009, shortly after the end of war against the Liberation Tigers of Tamil Elam (LTTE). SLAF used Israeli built 'Super Scout' 'Searcher MK II' and 'Blue Horizon II' UAV systems extensively to combat the terrorism since 1996. Having trained on the engineering aspects of UAV systems by Israeli

Aircraft Industries (IAI) many times and also having experience working with the UAVs for nearly 14 years, induced the confidence in me to believe that building a UAV system on our own was a possibility. Air Chief Marshal (retired) Roshan Gunathilake who was the Commander of the Air Force at the time offered his fullest support to start the project. Group Captain Mohan Balasuriya, Wing Commander (retired) Thejeka Wanigasekera and Engineer Salinda Thennekoon were my co-partners in building and flying the first UAV, UX 001. The UAV was completely designed and built indigenously. As much as, I was a staunch believer of the performance of 'Clark Y' wing profile, I did not have access to any practical methodology to prove it. In the year 2009, aviation professionals venerated the 'Longer Path' or 'Equal Transit Time' theory as the most accurate explanation of the 'aerodynamic lift', though we could not find any plausible set of equations that could be used to calculate the generated lift forces in different flight profiles. Subsequent to the building of the first UAV, our team researched vehemently on the subject while building and flying a couple of different UAV platforms. My continuous indulgence and dreaming about the ways of optimizing the air vehicle performance in terms of endurance often led me to think and review the lift theories in the contemporary aviation annals. I often talked with pilots and tried to visualize the way they feel the magic of flight. Yet, I continued to worry about the lack of straight forward explanation which is simpler to understand. In the beginning of 2017, my relentless interest in the phenomena of 'aerodynamic lift' led me to enroll in a PhD program at the Kotelawala Defence University with the expectation of finding something useful related to the subject. There, I was assigned with two brilliant supervisors Dr Nirosh Jayaweera and Dr Saliya Jayasekera from the Aeronautical Engineering Department at the University of Moratuwa. Both scholars on the subject, spent many hours assisting me to achieve my objective of finding something new related to my study. Dr Nirosh and Dr Saliya deserve my sincere gratitude for their guidance in formulating and publishing my work.

One needs to understand the theory of circular motion and the three Newtonian laws in depth in order to understand the Don's Theory on aerodynamic lift. Flight Lieutenant Shanake Sampath ,the brilliant materials engineer who is a proud product of University of Moratuwa joined the UAV Research Station in latter part of 2017. He worked with me ceaselessly addressing many aerodynamic issues of the Unmanned Aerial Vehicles that the UAV

Research Station was building. Engineer Sampath and myself would have spent many days carrying out analysis on the subject of aerodynamic lift before the light was shed on the new theory that I publish in this book. I would like to express my sincere gratitude and give the due credit to Engineer Sampath who was a great source of support in completing my initial research on the subject. 33462 Corporal Kumara AAA who generated the graphics of the book clearly depicting the phenomena was also a great source of strength that enabled me to complete the work to the expected standard.