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TO THE EDGE OF SPACE ON A GUST OF AIR

Gp Capt Vivek Kapur
Senior Fellow, CAPS

Introduction

Man first dreamt of flight in antiquity and thought about the possibility of his copying birds to soar above the earth. This dream was to be fulfilled only with the invention of the lighter than air hot air balloon, followed by the invention of dirigibles. Both these early means of man achieving flight involved passive means through use of the characteristics of gasses at high temperature and those of lighter than air gasses such as hydrogen and helium. These early means of flight had several limitations. These led to the endeavour to develop more reliable and suitable means of flight to persist. Finally, heavier than air flying machines were invented with the Wright Brothers' "Flyer-I" achieving a flight of a few hundred feet at Kitty Hawk in the USA on 03 December 1903. Subsequent developments in aviation have involved further refinements to the basic heavier than air aircraft that relies upon burning fossil fuels in a suitable power plant to achieve flight in the atmosphere. By the mid-twentieth century, with flight in the Earth's atmosphere firmly established, man was looking further aloft at the possibility of venturing into space. Early efforts at this involved use of rockets that rose vertically into space with considerable expenditure of fossil fuel. The rocket's parts were discarded after their one time use. Space flight up to even putting footprints on the Moon, and sending unmanned spacecraft to other planets in the solar system, were achieved in the latter half of the twentieth century. However, these achievements were costly as the building of a rocket was very intensive in materials, funds, technology, and time. Moreover, even the most efficient rocket fuels proved to be damaging to the environment and very toxic to humans and other life forms on Earth. Environmental concerns did lead to some sections of society questioning the benefits of conventional approaches to space in view of the massive expenditure in materials and the environmental damage. A section of aviation pioneers had meanwhile been toying with the idea and concept of flying a glider to very high altitudes. This was written about a year ago on this website under the title "Perlan-II: The Cutting Edge Of Aerospace Technology"[1].

The Perlan Project

The original Perlan-I glider chosen for these experiments was unpressurised, which led to the crew requiring to be clad in pressure suits. Originally, the glider hosted a small two stroke engine to facilitate self-launch from the ground. Later, this was modified to remove the engine, with towing aloft by a tow aircraft being the preferred means of initial launch from the ground. The initial project explored the extent of mountain waves in the vicinity of high north-south oriented mountain ranges such as the Rocky Mountains in North America, and the Andes in South America. The data obtained suggested that mountain waves in the vicinity of the high mountain ranges in some seasons could extend up to almost 130,000 feet above mean sea level (AMSL)[2]. The Perlan project planned to ascertain more characteristics of these mountain waves and then to explore the possibility of using these waves to achieve near space altitudes without any propulsive power plant on board the Perlan glider. In earlier missions very high altitudes were achieved but the project in stages planned to reach altitudes of up to 130,000 feet AMSL. The Perlan-I craft had achieved an altitude of 70,000 feet AMSL[3].

Latest Updates on the Perlan Project

The new Perlan-II glider is pressurised and has lighter and more advanced avionics and controls on board. The Perlan-II pressurised glider flew up to an altitude of 30,615 feet AMSL at its headquarters Minden-Tahoe Airport in the US during the past week[4]. The improved Perlan-II glider has been undergoing improvements during the past year of its exploring mountain waves in the vicinity of the Andes Mountain range. As the weather conditions become most suitable the Perlan-II is scheduled to move to Argentina during May 2017 to continue on its quest to reach near space altitudes without any kind of propulsion system on board. The objectives stated for the Perlan program include scientific research on weather patterns, wind flows over the Earth, and general scientific research into light and sturdy aerospace structures[5].

This said, it is obvious that access to near space altitudes has many economic and state security (military) applications as well. A major limitation of the project is the geographical fact that mountain waves of the kind needed to glide up to near space altitudes are found only in very few places around the world[6]. Hence, the use of gliders to reach almost up to space is likely to be limited to a few countries only. However, the technologies that can spin off from the Perlan project pertain to much more widely usable ultra-light aerospace structures, advanced high lift low drag aerodynamic designs and compact and light life support systems. These possible spin offs have potentially very wide application in aerospace programs around the world. This fact alone makes following the progress of the Perlan project very interesting.

Conclusion

Mankind has been fascinated with achieving flight for many centuries. These dreams were achieved initially through lighter than air vehicles and later through invention of the heavier than air aircraft. Next, mankind yearned to achieve access to outer space. Rockets were developed to achieve this aim. While work was underway on these fossil fuel intensive technologies a band of innovative thinkers were aspiring to use the nature of air patterns over the planet to achieve high altitude flight. The Perlan project aims to demonstrate the possibility of reaching near space altitudes without any power plant on board the craft. The nature of data already obtained makes it quite clear that very high altitude flight by the Perlan glider is feasible only at very few locations in the world. Both of these most promising locations lie on the American continents. However, the spin offs in high technology from the Perlan project, especially relating to very light yet strong aerospace structures and advanced high lift aerodynamics, make following the Perlan project very interesting. More discoveries and achievements can be expected from the Perlan team in the months ahead.

(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

Notes

[1]Vivek Kapur, "Perlan-II: The Cutting Edge Of Aerospace Technology", CAPS InFocus, http://capsindia.org/files/documents/CAPS_Infocus_VK_41.pdf, accessed on April 26, 2017.

[2]Ibid. pp3-5

[3]Ibid.pp4-5

[4]Spacewar.com, "Pressurized Perlan Glider Reaches New High Altitude on Journey to Edge of Space" Spacewar.com, ttp://www.spacedaily.com/reports/Pressurized_Perlan_glider_reaches_new_high_altitude_on_journey_to_edge_of_space_999.html, accessed on April 26, 2017.

[5]Ibid.

[6] Tom LeCompte, "Sailplane to the Stratosphere", Air and Space, http://www.airspacemag.com/flight-today/sailplane-stratosphere-180959154/, accessed on April 26, 2017.