

GLIDING :: A SILENT FLIGHT

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Man has lived at the bottom of a sea of air from time immemorial and his very existence has depended on it. He has watched the birds for thousands of years and longed to imitate them. There have been stories of flying from the time records have been kept. There are legends like Etanas' flight in Babylon aboard a giant eagle, Ki-Kung-Shi in China on the flying chariot, the Persian King, Kai Kawus, Alexander the Great, the Greeks' winged horse Pegasus, the famous story of Daedalus and Icarus, India's Pushpak Viman, Mercury of the Romans, etc. Everybody got into the flying act. Every culture and every society has its story on flying.

It was only in the eleventh century that the first believable story of Oliver of Malmesbury, an English monk-mechanic-mathematician, "Le Causet To Mak Ane Pair Of Wingus" whereupon he flew, broke both legs as he forgot to attach the tail to the "hinder part", came to light. Leonardo da Vinci's ideas were ahead of his time and the technology of that era was not developed enough for his contraptions to work. Isaac Newton prophesied of his Third Law of Motion, "This is the principle which will enable mankind in later centuries to undertake flights to the stars."

It was however, in the early 1800s that George Cayley set down the principle that "Air must be forced over wings to create lift." Thereafter, there was a rash of ideas and after working on Cayley's theories for thirty years, the real breakthrough came in 1890, when a German, Otto Lilienthal made and flew the first cotton-covered bamboo-framed, glider. He was the first to understand and use gravity as motor power and surface controls for stability. In 1896, while experimenting on flight stability, this Father of Aviation was killed in a glider flying accident. By 1902, the Wright brothers were experimenting and making successful glider flights, which led to the famous Kitty Hawk. The Babylonian Etana flight was now no longer a fantasy, but a fact. This was possible due to the scientific temperament, which guided the development of technology, as well as the dedicated, avid perseverance of earlier aviators.

Very often the question is asked, how does a glider fly? A glider is a heavier-than-air aerodyne which is supported in the air by aerodynamic reactions and is not provided with mechanical means of propulsion. The glider flies by the same principles as an aeroplane. The four forces acting on an aeroplane in flight are: lift, weight, thrust and drag. The wings are of an aerofoil shape, which when moved through the air, produce an aerodynamic reaction called the lift. When the wings move through the air, air-resistance is experienced which is called the drag. Gravity is easy to understand, just drop a hammer on your toe, you will not only

understand it, but are also not likely to forget it! However, a glider does not have an engine to provide the thrust. In a free flight, the lift is inclined forward and the reaction of lift and drag balances the gravity, and the pull of the gravity and the inclined lift in the opposite direction provides the forward motion to the glider. Therefore gravity, which was considered a useless force for the powered flights, becomes a friendly force for the glider flight. This force moves the glider through the air, forcing the air over the wing to produce lift. To accomplish this, the nose of the glider is pointed down slightly in order to obtain the necessary speed to allow the flow of air over the wings. That means the glider is always in a descending attitude and is always gliding down.

This explains the principle of gliding, but then, what is soaring? Conventionally, the descending flight of a glider is called gliding and ascend in a free flight is called soaring. A simple experiment with a paper plane can explain this. Sail the paper plane across a room in still air. Its flight will be a continuous gradual descend. Now fly the same paper plane over a campfire. The plane will glide down till it gets into the rising warm air over the fire; then it will climb, though it is still under the influence of gravity and is still descending in the immediate air around it. But since the whole mass of air over the fire is rising and, as the rate of sink of the paper plane is not as fast as the rate of climb produced by the column of rising hot air, the paper plane ascends. In glider flights, such ascends are called soaring. In the atmosphere, the convection currents or the updraft thermals are produced by the uneven heating of the earth during the day and the orographic lift, produced due to the flow of the air over the hilly terrain. The buoyancy and the frequency of the updraft is directly governed by the prevailing lapse rate of the temperature.

The other challenging invention in glider flight was the mechanism for the initial launching of a glider in the air. Many wonderfully designed gliders were lost in crashes due to unconventional launching mechanisms. Lilienthal launched by jumping off a mound a few hundred feet high, Montgomery carried his glider aloft by a balloon and then cut free. Everything from sling-shots to shoving the craft off the cliffs has been tried. However, today winch-tow, auto-tow and air-tow by an aeroplane are the three accepted safe methods of towing a glider in the air.

The Indian chapter of gliding started in 1929 at the town of Aundh, a small state southeast of Pune, with an imported primary glider acquired using a handsome donation from the Raja Sahib of Aundh. This gliding club was later shifted to Hadpasar in Pune. The gliding movement picked up in India due to the keen interest of House of Tatas, His Excellency of Jodhpur, His Excellency of Jaipur, Sir Homi Mehta, Pt. Jawaharlal Nehru, and under the able guidance of Mr. F. H. Irani, the first qualified gliding instructor. During 1959-1968, many clubs and centres were opened in the country.

The period of 1965 to 1975 can be considered the best period of Indian gliding, when flights of over nine hours duration and cross country flights of 540 km by Captain Ian Loughran were achieved as the national record. During 1965, Captain

Dinesh Chandra did a flight from New Delhi to IIT Kanpur in the Indian-made "Kartik II" glider, which earned him a 'Diamond Pin' from the Federation Aeronautics International. Captain Charan Singh of Delhi flew to a height of 21,500 ft. (22,000 ft. above sea level), which is still a national record. In the field of glider design India has produced Mr. S. Ramamritham and Mr. K. B. Ganeshan of international fame, who produced gliders like Rohini, Ashvini, Bharni, Kartik and Mrigsheer at the technical centre of the Directorate General of Civil Aviation. These gliders were beautifully designed, but being made of wood and fabric, they could not compete with the standards set by the world market.

The Gliding and Soaring Centre at IIT Kanpur was established in 1966 under the subsidised glider flying scheme of the Government of India. Gliders were acquired for the flight laboratory for the academic flight experiments. During the lean academic period gliders were used for flight training of students. This aviation sport soon picked up and became very popular among students. Gliding is also popular among the general public as they get a chance to have an aerial view of our beautiful campus in a glider joyride. This centre has the distinction of holding the pre-World-Championship training camp in 1968 for the Indian team and the first National Gliding Championship in 1973.

Though the activity has become very popular for the flying aspects of the glider, the motivation of students to get involved in the actual design and development of gliders is still missing, which was the primary aim of setting up such a centre at a premier institute like IIT. It would be an interesting exercise for a group of students to develop a design for a full scale glider model, another group to check the design and calculations for the specifications laid down for the International Standards, and a third group of students to get into the fabrication of a model of this indigenous design. The flying of such a model at IIT Kanpur would fulfil the aspirations for which the sophisticated flight laboratory and the Gliding Centre were established.