PARACHUTES are fun to watch and exciting to ride. They slow the motion of the body by increasing the drag due to their large surface area and light weight. In other words, they reduce the vertical fall speed if deployed vertically or increase drag on the object if deployed horizontally with respect to the ground. These attributes have been used for centuries in different applications of parachutes.

They have been used for recreational purposes such as parasailing as well as for various aviation purposes too. The most common services of parachutes in aviation industry include emergency pilot parachute landing, and providing aid in landing of airplane, space shuttle, spacecraft and fighter jets. They also provide tactical advantages in wars and help in rescue and recovery operations.

The history of parachutes dates back to the 1400s but the modern parachute was invented in the late 18th century by Louis-Sébastien Lenormand in France. Since then, several design modifications and improvements have been made in parachute technology.

The size of the parachute depends on the weight it could bear safely. A large enough parachute can be made to safely glide and land an entire airplane. Flying an aircraft involves greater risk as compared to driving a vehicle on the road as it can’t be parked anywhere as can be done with a malfunctioning car. If something goes wrong, only one force is enough to bring the airplane to ground within seconds—gravity. Therefore, flying vehicles require much more safety margins and safety measures.

A parachute can be used in emergency and can even be deployed if the airplane power source shuts down as it doesn’t need any electrical or powered equipment to operate once deployed. They can glide the plane safely to the ground saving not only several lives but the airplane as well.

The first use of the whole plane parachute was by stunt pilot Roscoe Turner when he landed a Lockheed Air Express in 1929 in California, USA. Thereafter, Bob Fronius, an aircraft mechanic, an aviation enthusiast and a parachute maker, made several attempts at parachute jumping and parachute aircraft landing. He was an experimentalist and always played with his parachute designs to achieve the desired results. He never commercialized his parachute designs though.

Pilot Boris Popov created the first commercial plane parachute in 1980 after surviving a 500 feet fall from a hand glider. He realized that only a parachute could have saved him in that situation. He started a company called Ballistic Recovery Systems (BRS), in Minnesota, USA in 1980 and produced the first commercial parachute to be used with light aircrafts in 1982. The company made a successful aircraft parachute landing in 1983. They collaborated with Cirrus Aircraft Corporation in 1998 to produce the parachute recovery system for certified commercial aircrafts. Cirrus Aircraft Systems were the first to install Popov’s parachute in all their aircrafts.

Since then these systems have been tested and installed in various light aircrafts like Cirrus SR20, Cessna 162, 172 and 182, Katmai-260se and Symphony SA-160 to name a few. Since their production in 1982, around 265 lives have been saved till date by the use of parachute recovery systems. NASA also helped BRS in making thin-filmed stronger parachutes and smart deployment methods.

An exhaustive study about the design, manufacturing, testing and operation procedure of parachute recovery systems can be found in the book Parachute Recovery Systems Design Manual by T.W. Knacke first published in 1992.
There are several challenges in devising a practical whole plane parachute system. It should be light as well as big and strong enough to carry the aircraft weight. A parachute made for one person requires at least 100 square feet area. Nylon cloth, normally used for parachutes, cannot be used for a whole plane parachute, as it would weigh equal to the size of the airplane. Due to advancements in materials research, it has become possible to fabricate a parachute out of a super-strong lightweight composite that is five times tougher than steel but 100 times lighter. A 1000 square feet of this cloth weighs only 30 pounds. Another problem with these large parachutes is the space they occupy. To solve this problem, parachutes are folded efficiently to save space and high (around 11 tons) pressure is then applied to reduce the folded size of the parachute. The folded chute is as dense as a block of wood.

Another challenge is to deploy the parachute quickly in case of an emergency. The idea is to blow them out quickly by using rockets. The rockets used for this purpose are manufactured very carefully; they should neither be too strong to blow the parachute too quick which can also destroy the plane and injure the passengers nor should they blow the parachute too slow leaving lesser time for the plane to land smoothly. When the rockets fire they push the parachute through a five-feet glass panel of the rear windshield without doing any damage to the rest of the plane. The rockets are ready to fire when installed and need to be handled very carefully while deploying the parachute.

Today, 30,000 whole plane parachutes are flying all over the world installed on lightweight aircrafts. The commercial aviation traffic is increasing day-by-day carrying thousands of passengers all over the world. This further presses the need for efficient safety measures that should be available on commercial planes. Several mishaps in the history of commercial aviation could have been avoided if a parachute recovery system was onboard. The biggest constraint in installing the parachute recovery systems on these big planes is their weight and speed but with the technology in place for light aircrafts, parachutes may be available on commercial airplanes very soon.

Another application of parachutes is providing help in water landing of spacecrafts. During re-entry, the spacecraft enters the atmosphere and the parachutes open well before they splash on the water body to reduce the impact of water on the spacecraft. This method is known as splashdown and was used for several manned space missions such as Gemini and Apollo.

Parachutes increase drag on the body if deployed horizontally. This characteristic is used in landing of high speed flying vehicles. Drag chutes are installed on space shuttles such as NASA orbiters Endeavour, Atlantis and Discovery to help reduce rollout speed after touchdown. These space shuttles were used to carry crew and scientific equipment to the International Space Station (ISS) by NASA during their 30-year space shuttle program that ended recently when Atlantis STS-135 landed in Florida on 21 July 2011. Endeavour, delivered to the Kennedy Space Center in 1991, was the first to have this modification. When the shuttle reaches a speed of 70 mph, the 40-feet chute is released to increase the drag on the shuttle thus reducing its speed.

The Russian spacecraft Soyuz has four parachutes that are deployed 15 minutes before landing. Two pilot parachutes are deployed first that reduce the vehicle speed considerably. Then drogue chute, measuring 258 square feet, is released which reduces the rate of descent from 755 feet per second to 262 feet per second. The main parachute, measuring 10,764 square feet is deployed last. Commercial aircrafts like Boeing 747s land at around 160 mph, which is about 60 mph slower than the space shuttle orbiter touchdown speed. Some modern-day fighter jets such as RAF Typhoon also use drag chute for landing.

So, the next time you get a chance to see or glide in a parachute, remember its use and its importance in the aviation industry.

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