

PARACHUTING – THE AGE OF THE FIRST ATTEMPTS

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***Abstract:** Paradoxically enough the age of the parachute precedes that of the flying machines by several centuries, so they actually emerge even before man managed to rise into the air.*

The idea of creating an "umbrella" that allows the descent of a human being from extreme heights is very old, as it is present in various legends and stories, with different populations.

This article aims to bring its readers closer to the age of the first trials in parachuting. Thus, it shows how the parachute appeared, what the trials of the greatest inventors were, and makes a necessary connection between parachuting and the beginnings and progress of aviation.

Keywords: parachuting, inventors, aviation, history

1. INTRODUCTION

This article aims to provide to its readers a history of two branches of aeronautics, parachuting and aviation. Even though countless works have been written about these two branches, I will try to compile the main moments in their history. Of course, a review could not be done without proper details on how all these flying means were created: parachute, balloon or plane.

Paradoxically, but the age of the parachute exceeds that of the flying machines by several centuries, so even before the man managed to rise into the air.

The idea of creating an "umbrella" that allows the descent of man from very large heights is very old, being present in various legends and stories, in different populations.

In the following I will address the emergence and development of parachuting and aviation worldwide, while a prospect of the emergence and development of the two branches at national level will be the subject of another article.

2. THE BEGINNING

Man, from ancient times, turned his gaze to heaven and wanted to detach himself from the earth, to be like the birds. That is why in the history of populations myths and legends that speak of these nations were preserved.

Perhaps the most famous example of this is the legend of Icarus, a name that has become the symbol of mankind's dream of flying. Icarus, son of Daedalus, was imprisoned with his father in the labyrinth palace by King Minos. This palace was built by Daedalus at the request of Emperor Minos so that the monster with a human and bull's head, the Minotaur, could not get out. The Minotaur was killed by Theseus with Daedalus' help. As a result, Daedalus and Icarus, imprisoned in the labyrinth, had to find a way out. The idea of getting out of the maze was to fly with some wings made of feathers and bird bones waxed by the hands of the two.

Icarus was warned by his father not to fly too low, not to get wet or too high to melt wax, but he did not listen.

As it spread to the high sea, Helios – the sun, melted the wax, the wings detached and Icarus found its end in the waters of the sea.

Thus, Icarus became a symbol of ego dualism - boldness, reasoning - courage. The discovery of the parachute is lost in the mists of time and it is not possible to determine with certainty who was the first paratrooper. Going back to the legend of Icarus we can ask ourselves whether he was the first aviator or the first paratrooper.



FIG. 1 The fall of Icarus, son of Dedal [1]

The first flight attempts or the first air field data of which certain evidence exists are those that were trying to find an appliance that actually lowers the crash speed.

The first documentary attestations in this respect were those in China. Here the first evidence of this area concerned shadows and kites. China had all the necessary materials to manufacture the two objects: bamboo for the construction of the frame and silk for the realization of the body.

As for the first manuscripts relating to the attempt of some to fly, I must recall that the first scientific reference to the possibility of flying man was made by Roger Bacon, an English Franciscan monk. In his book entitled "Secrets of Art and Nature", published in 1252, he refers for the first time in a chapter "About wonderful appliances" and the possibility of building a flying device in which a man could sit and who could fly acting wings that would beat the air like birds.[2]



FIG. 2 Leonardo da Vinci's parachute design [3]

If Roger Bacon brought to reality the man's desire to fly, by mirroring recorded documents, Leonardo da Vinci did the first scientific research on the flight. In his books "Codice Atlantico" from 1485 and "Codice sul volo degli Ucelli" from 1505 we encounter several sketches about this field: a sketch of a parachute, another about a device used for flying with swing wings that are driven by muscle force, another about the principle of operation of the helicopter. He is also the one who finds the right word for the helicopter, merging the Greek words "helix" which means "spiral-shaped" and "pteron" meaning "wing".

Around 1500 Leonardo da Vinci designed a parachute, as seen in the figure, shaped like a pyramid, the base being a square.

Next to this Leonardo made a note: If man has a tent of scrotum cloth, wide on each side of 12 cubits and 12 tall cubits he will be able to let go of any height, without anything bad happening to him. [4]

The parachute Leonardo designed was not put to trial until many years later. Although this type of parachute was thought not to work, the facts refuted this preconceived idea. In 2000 Adrian Nicholas, an English engineer, using Leonardo da Vinci's sketches, made a parachute with the materials that existed at that time. He wanted to prove that the parachute designed by Leonardo da Vinci can be built and it can work. Among the materials used were the canvas used by the painter as a support for his paintings. When he tried to experiment, he was struck by the refusal of the English authorities who considered this parachute extremely risky for real trial. Therefore Nicholas chose South Africa as the destination for experimenting with this parachute, a country where legislation in this area is much more permissive.

He rose with a hot air balloon to a height of 3000 meters from where he descended with an open parachute to a height of 600 meters. Here he expanded da Vinci's parachute and opened another parachute with which he came to land. When asked why he did so, Nicholas said: Not because I didn't trust a slow landing, but I was concerned about the weight of the parachute, which weighed 85 kg. Think about what would have happened on landing if it had come to my head? [5]



FIG. 3 Adrian Nicholas's jump with Leonardo da Vinci's parachute project [6]

Thus Nicholas proved that Leonardo da Vinci's calculations were as accurate as possible, and we can say without making a mistake that Leonardo da Vinci is the "father" of the parachute.

In order to reinforce the previous claim, I must also recall the jump made by the Swiss skydiver Olivier-Vietti Teppa. He was launched from a helicopter at a height of 650 meters with a parachute made according to da Vinci's model, but using topical techniques and materials. He landed safely in La Payerne, where the experiment took place. The figure shows us this leap and demonstrates once again Leonardo da Vinci's genius and his revolutionary ideas.



FIG. 4 Olivier-Vietti Teppa's jump with Leonardo da Vinci's parachute project [7]

But let's go back in time one hundred years after Leonardo da Vinci's project and check that the next document featuring the idea of parachute is that of Fausto Veranzio, a mathematician of Hungarian origin established in Italy. It describes the phenomenon of falling and the possibility of saving itself: "With a piece of square cloth, lying on a frame consisting of four equal poles, from which four ropes are caught in the four corners, a man can throw himself without any danger from the top of a tower, or from another high place. Even if the wind does not blow, the air will inflate the cloth and hold it, and the man will not collapse, but will slowly descend. Of course, the size of the surface of the blade must be chosen by man's weight." [8]

Looking at Veranzio's claims about "Volans Homo", "Flying Man" we realize that he had made a fairly accurate opinion about the fall of the bodies and the operation of the parachute. Although in some sources it is shown that Veranzio had done several experiments, jumping several times from a tower in Venice at the age of 61, this information is however not substantiated and it has been concluded that Veranzio has failed to carry out its trial project.

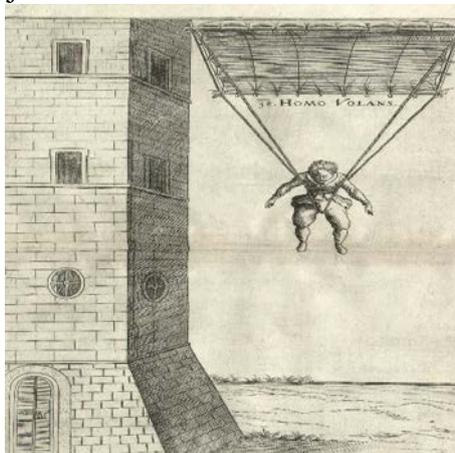


FIG. 5 Veranzio's Homo Volans [9]

Continuing through the mists of time and talking so far about aeronautical projects I should also mention the first balloon project. It belonged to Italian-born physicist Francesco Terzi Lana, who wrote in 1670 of a "flying boat caught by four metal spheres about 7 meters in diameter from which it had to be vacuumed by removing air by pumping." [10]

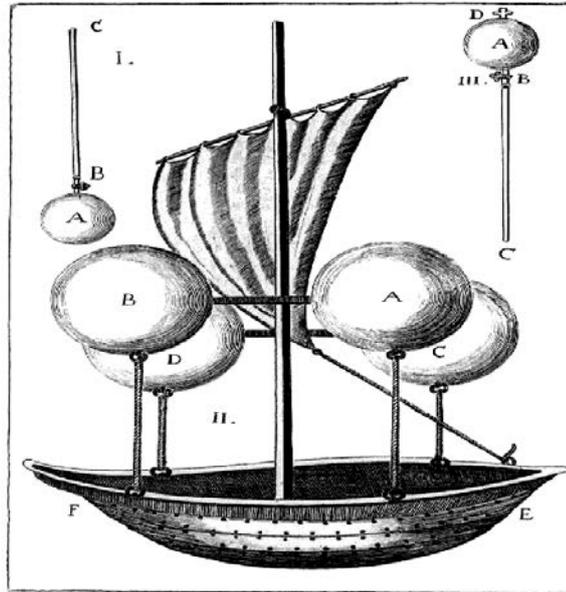


FIG. 6 Francesco Terzi Lana's project [11]

Although he has never been able to complete his project, Terzi Lana remains in history as the first researcher to use Archimedes' law in the idea of building an airline. Due to his revolutionary ideas Francesco was persecuted by the Inquisition, accusing him of witchcraft.

The 5th of June 1783 represents an important moment in this history of aeronautics, as the French brothers Joseph and Etienne Montgolfier launched the first hot air balloon. The hot air balloon was named Montgolfier, taking the name of these two inventors. There was a dispute on this event, which is the first flight of a hot air balloon. At the International Aeronautics Congress in 1889, Brazilian Rear Admiral Teffe challenged the Montgolfier brothers' flight as the first and provided evidence that the first flight of a balloon had been made by Brazilian priest Bartolomeo Lorenzo de Gusmao in 1709, at the court of King John V of Portugal and Queen Maria Anna. The evidence was rejected as insufficient and thus remained in history that the rise to a height of 1000 meters from June 5th, 1783 was the first flight of a hot air balloon.[12]

After Newton conducted air resistance research in the same year the launch of the first hot air balloon, 1783, French physicist Sebastien Lenormand conducted several experiments to launch several objects hanging from parachutes, from the observatory in Montpellier. His motivation was to try and uncover the necessary equipment to be used for people that would be trapped in high buildings engulfed in flames, where the only possibility of rescue would have been to leave them with objects to ensure their landing. Lenormand first used the term parachute, which is preserved to this day.

The word was born by merging two terms: "para" which means keeping or appearing in Greek – against and "chute" which means fall. If da Vinci is considered the "father" of the parachute, then Lenormand is its "godfather".

If we look at this parachute word, we could say that it is the wrong one to assign because this type of object does not block the fall or resists it, but only reduces the drop speed of an object to a non-hazardous speed.

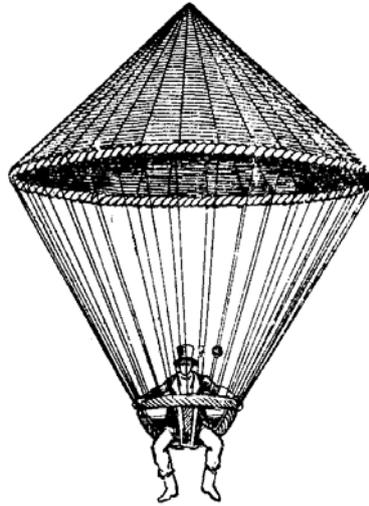


FIG. 7 Lenormand's parachute [13]

Lenormand trusted the calculations and experiments he had done, so on December 26 1783 he came down with his parachute open and landed safely from the tower of Montpellier astronomical observatory.

The same year, 1783 is also the year of the development of balloon ascents. On September 19 same year, the rise of the first passengers with a hot air balloon takes place. In the second balloon built by the Montgolfier brothers the passengers were a sheep and a duck. They landed safely after a flight of about eight minutes and an ascent of about 500 meters. This event was witnessed by the monarchs of France: King Louis XVI and Queen Maria Antoinette. On November 1st, French physicist Jean Francois Pilatre de Rozier and Francois Laurent marquis d'Arlandes were the first passengers of a free balloon. By then the balloons were tied with a rope, but the two managed to rise by balloon at a height of 1000 meters and cross Paris for about 10 km.

Due to increasing growth, the development of aeronautics called for a new stage. Thus in 1797 Pierre Blanchard managed to launch by parachute a goat that lands smoothly, from a balloon in Hamburg

In the same year on October 22nd, Frenchman Andre-Jacques Garnerin becomes the first man to carry out the first parachute jump from a balloon. The launch height was about 600 meters, but the parachute had some rather large oscillations, close to 900, so the landing was quite harsh, with Garnerin ending up with a fracture. Garnerin received the help of astronomer Lalande who suggested to make a small hole in the center of the upper veil through which the excess air would leak, in order to make the parachute more stable. [14]

After making that slot at the top of the veil, Garnerin's parachute had stability and was presented before a French military commission on the Champs de Mars. This committee had no vision and only congratulated Garnerin and gave him a thank-you letter and nothing else. So, the military use of the parachute had to wait for long more.

Jeanne Genevieve Garnerin's wife accompanied him on many of his balloon trips and on November 10 1798 she was the first woman to carry a parachute jump from a balloon. The Garnerin family was an exceptional one and one full of records established in this area of aeronautics. Garnerin's niece, Elise, became the youngest parachutist, at only 16.

Garnerin continued his parachute activity until 1823, when he had a fatal accident.

The balloon age was in full swing. Even though they were hard to fly, the balloons were considered safe appliances. Accidents took place. After Kuparento's success in 1808, who managed to save himself by jumping from the flaming balloon over Warsaw, there was a new possibility of using the parachute, that of saving the lives of those that may have been in danger during their air journey.[15]

The period of skydiving stunts was characterized by the fact that many paratroopers were tempted by money prizes and risked their lives by usually performing jumps with parachutes that were either not initially tested or had no experience in this field or appropriate training. These parachute jumps executed by inventors, acrobats or even fearful were true shows.

At that time, the parachutist was sitting in the parachute nacelle and was tied to the balloon by a rope. The moment he wanted to make the jump, he'd cut that string and thus get down with his parachute open. This could have not worked, and that's why there was some reluctance to use parachutes.

Sometimes these attempts ended tragically, resulting in the death of the jailers. In this respect, examples of Englishman Robert Cocking and Belgian Vincent de Groof. On September 27th, 1836 Cocking crashed with his parachute, that had a form of an inverted cone. Due to the skeleton of the parachute in the wooden slats that gave way, the parachute closed after it was unlocked from the balloon. Vincent de Groof collapsed from a height following the disposal of his parachute "with wings."

The first to use harness instead of a nacelle was Captain Thomas Baldwin in 1887, one of the leading pioneers of American skydiving. He made a similar harness to the one that is used today.

The parachutes were big and bulky and tied to the balloon net. The next step in the development of the parachute is its folding. The acrobatic paratroopers Lattermann and Kathe Paulus were the first to use this idea, in which the parachute was folded into a compartment that was undone by the parachute's operation of a string.

Aeronautics developed more and more and the first flight attempts are emerging. There are a number of polemics about the award of the first flight. I'll just remember a few of these in the chronological order of events.

Clement Ader, a French engineer, said he flew with a device equipped with steam and wheel machines in 1897, about 50 meters from the ground. According to most historians, he apparently did not fly, but only ran, and the veracity of his words cannot be confirmed because there were no witnesses.

In 1903 Karl Jatho, a German engineer, allegedly made a triplane flight to Hanover at 75 centimeters over a distance of 18 meters. The shortcomings that expressed themselves as far as he was concerned were the fact that the planes were not stable and had no command elements.

Another example is the work of German Gustav Weisskopf. He arrived in the U.S., changed his name to Whitehead and executed several flights in 1901 and 1902, but there is insufficient evidence on this.

The Wright brothers' four flights, made on December 17th, 1903 to Kitty Hawk, a North Carolina beach with a Flyer biplane, are classified as the first flights made on a motor plane that instead did not take off by its own means, but with a device catapult type. Though being advertised, these flights had only five witnesses being present. One of them took a picture of one of the flights.

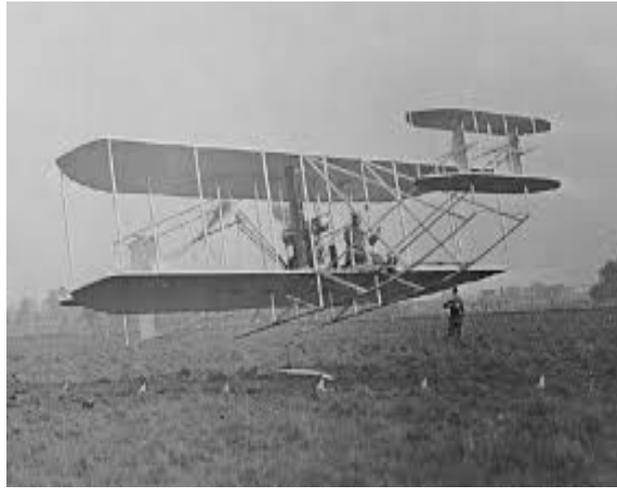


FIG. 8 The Wrights' brothers flight [16]

After motor planes appeared, the parachutes headed for another stage, that of saving the pilot in emergency situations, when it was necessary to leave the plane. The experiments were numerous, even though at first the idea of the balloons was taken up. This solution was not viable and that is why parachutes had to be adapted to the new conditions. Gleb Yevgenyevich Kostelnicov, a Russian inventor, developed in 1911 a metal knapsack???, fixed on the back of the paratrooper, in which the parachute was folded. When the opening command of the knapsack was taken, some springs arranged inside the knapsack would throw the parachute out, which then opened. This principle is still preserved to this day.

One more important step took place when the first parachute jump was carried out from a plane. It was made by Captain Albert Berry in the area of Saint Louis, Missouri, on March 1, 1912. Shortly later, on 19 August 1913, French aviator Adolphe Pegoud became the first pilot of a plane to be rescued by a forced parachute.[17]

Next, I will make a brief comparison on the inventions and inventors in this area, of parachuting. I chose the pioneering period and of course the period when the evidence of these inventions materialized into documents written according to the rules. These inventions are quite numerous, but I have only stopped at some who, in my view, have made a greater contribution to this phenomenon. I chose to do this, in tabular form, adding images of those inventions, because as they say, a picture is worth a thousand words. In addition to the images, I will also add some explanations for these inventions. The period I chose is the end of the 19th century and the beginning of the 20th century.

TABLE 1 Parachute patents in the age of first attempts [18]

No.	Name of invention	Name of the inventor	Country of origin	Patent Date	Patent Number	Remarks
1.	Safety parachute-pack	Leslie L. Irvin	U.S.A.	December 2nd, 1919	267065	See fig.9
2.	Pilot parachute with automatique and fast deployment	Lemale L. Charles	France	January 19th, 1911	425038	
3.	Safety parachute sack	Balondrade M. Jules	France	January 25th, 1911	425222	
4.	Parachute	Stephan Banic	U.S.A.	August 25th, 1914	842645	See fig.10

No.	Name of invention	Name of the inventor	Country of origin	Patent Date	Patent Number	Remarks
5.	Parachute	Herman Ludtke	U.S.A.	May 14th, 1914	203702	
6.	Parachute	Ruff Wiliam	U.S.A.	September 14th, 1920	252309	
7.	Parachute	Tanner Joseph	U.S.A.	March 12th, 1912	605301	
8.	Parachute	Smith Floyd	U.S.A.	May 18th, 1920	246999	See fig.11
9.	Improvement in fire-escape	Oppenheimer Benjamin	U.S.A.	November 18th, 1879	221855	See fig.12
10.	Parachute	Van Vleet Charles	U.S.A.	December 19th, 1905	143033	
11.	Improvements in parachutes	Mayer Carl Grimmer Ernst	Germany	April 21st, 1910	1640	
12.	Life-saving device	Rectanwald John	U.S.A.	November 8th, 1910	558387	
13.	Improvements in parachutes apparatus	Ulmer Calhoun	U.S.A.	March 23rd 1911	24167	
14.	Safety device for automatus parachute	Kotelnicoff Gleb	Russia	March 23rd 1912	438612	See fig.13

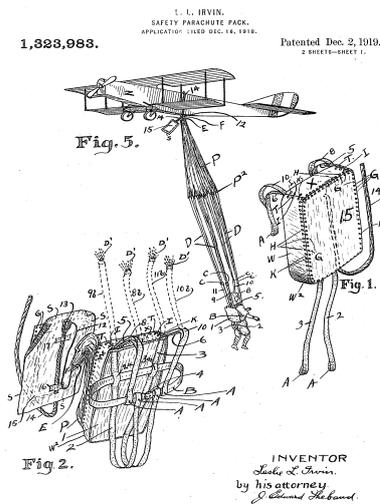


FIG. 9 Safety parachute-pack – Leslie L. Irvin -This invention relates to safety parachute packs, particularly to that kind which includes the systematically packed parachute and connections in a neat sack. [19]

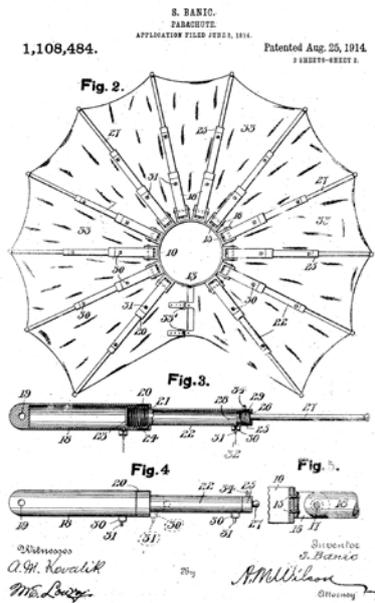


FIG. 10 Parachute – Stephan Banic - This invention relates to a parachute of collapsible type which may be easily and quickly attached to the body of the wearer and readily distended to operative position when desired [20]

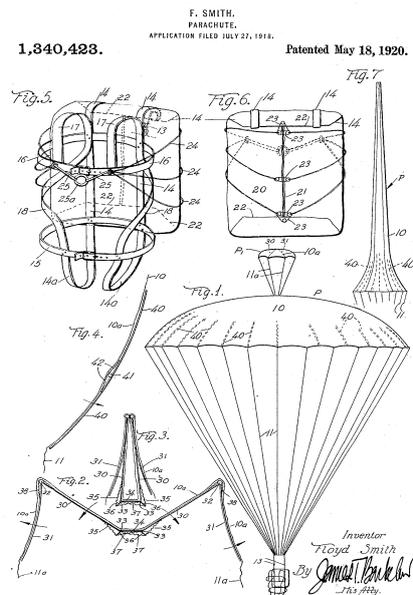


FIG. 11 Parachute – Smith Floyd - This invention provides a dependable means for causing the straightening out and opening of the parachute under all conditions, including certain conditions under which the present type of parachute is totally inoperative or deficient in operation [21]

B. B. OPPENHEIMER.
Fire-Escape.
No. 221,855. Patented Nov. 18, 1879.



WITNESSES:
Henry N. Miller
E. D. Morgan

INVENTOR:
B. B. Oppenheimer
BY *Merrill B.*
ATTORNEYS.

FIG. 12 Improvement in fire-escape - Oppenheimer Benjamin - This invention consists of a parachute attached, in suitable manner, to the upper part of the body, in combination with overshoes having elastic bottom pads of suitable thick mess to take up the concussion with the ground. [22]

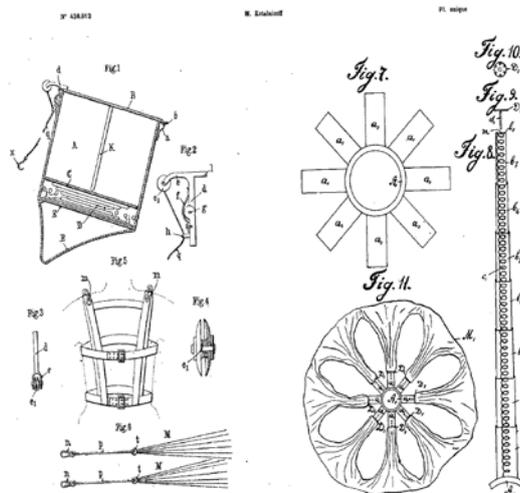


FIG. 13 Safety device for automatous parachute - Kotelnicoff Gleb - This invention consists of a safety device where the parachute is closed and at the moment of pulling up the parachute is thrown out [23]

3. CONCLUSIONS

All the history I mentioned above is the skydiving pioneering period and its impact on the related field, aviation. The origins of these branches of aeronautics are intertwined, complemented and the development of one has also led to changes in the other field. Even though I have brought up certain facts which have happened recently, I have only strengthened the visionary and revolutionary genius of those personalities.

As you have noticed, I have not brought up any achievements made in the field of Romanian aeronautics. I intentionally omitted this because this topic will be treated separately, as a different topic of another article.

Achievements in these areas are not few and have been made with the sweat and even the ultimate sacrifice of many fearless pioneers. Thus, it seems only appropriate to close this overview with the following citation from Albert Einstein as “Our mind is like a parachute: it only makes sense if it opens.” [24]

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