

Hot Air Ballooning

The birth of the hot air balloon was largely associated with the efforts of two French brothers, Joseph and Etienne Montgolfier, who employed the fact that hot air was lighter than cool air and using this, managed to lift a small silk balloon 32 metres into the air. The brothers went on to elevate a balloon into the air ten thousand metres before it started to descend and then exploded. Despite their arguably limited success, their work came to the eye of the French Science Academy as the discovery of the properties of hot air balloons helped scientists to study weather patterns and the atmosphere. It was not until some considerable time later that a balloon was launched that was capable of carrying passengers. Initial flights were trialled by animals, but after the success of these voyages, two passengers, Jean Francois Pilatre and Francois Laurent d'Arlendes, were sent up in a balloon which travelled across Paris for 29 minutes. The men fuelled the fire in the centre of their wicker basket to keep the balloon elevated and the trip across Paris was a great success.

The discovery of hydrogen-fuelled flights led to the death in 1785 of Pilatre, a tragedy which caused a downfall in the popularity of hot air ballooning but an increase in the popularity of hydrogen. Hot air ballooning lost further ground when alternate modes of air travel were introduced, but in the 1950s, ballooning experienced something of a revival as a leisure activity and sport. Today there are balloons of all shapes and sizes, with many unique designs.

In 1987, British entrepreneur Richard Branson crossed the Atlantic in a balloon named Virgin Atlantic Flyer. At the time, this balloon was the largest ever constructed at 65 thousand cubic metres, but four years later, he and Per Lindstrand from Sweden flew nearly 8000 kilometres from Japan to Northern Canada in their balloon the Virgin Pacific Flyer, which was nearly 10 thousand cubic metres bigger and was the longest flight in a hot air balloon ever made. The Pacific Flyer was designed to fly in the trans-oceanic jet streams and recorded the highest ground speed for a manned balloon at 394 kilometres per hour.

There are now a wide variety of designs and equipment available, from baskets with room for two people right up to 35 or more, separated compartments and specially

designed flame resistant fabrics, but the basic parts of the balloon have remained relatively unchanged. There is a basket, commonly made of wicker, inside which are stored the propane fuel tanks. Immediately above the basket and partly wrapped around by the skirt are the burners, attached on suspension wires. The balloon itself is made of strips of fabric called gores which run from the skirt to the top of the balloon; they are further broken into individual panels. This section of the craft is referred to as the envelope. At the top of the envelope is a self-closing flap that allows hot air to escape at a controlled rate to slow ascents or cause the balloon to descend. This is named the parachute valve, and is controlled by the vent line – the cable that runs the length of the envelope and hangs just above the basket so the pilot can open and close the parachute valve.

At the mercy of prevailing wind currents, piloting a balloon takes a huge amount of skill but the controls used are fairly straight forward. To lift a balloon the pilot moves the control which releases propane. The pilot can control the speed of the balloon by increasing or decreasing the flow of propane gas, but they cannot control horizontal direction. As a result, balloons are often followed by ground crew, who may have to pick up the pilot, passengers and balloon from any number of landing sites. A pilot who wants to fly a hot air balloon must have his commercial pilot's license to fly and must have at least 35 hours of flight instruction. There are no official safety requirements for passengers onboard, but they should know whom they're flying with and what qualifications they may have. For safety reasons, hot air balloons don't fly in the rain because the heat in the balloon can cause water to boil on top of the balloon and destroy the fabric.

One of the largest hot air balloon organisations is the Balloon Federation of America. Founded in 1961, membership in the BFA attracts those with a fascination with ballooning (or 'Lighter Than Air' flight). With an active discussion forum, meetings and displays all around the USA and beyond, the BFA runs on a number of guiding principles, primarily that the future of ballooning is directly related to the safety of enthusiasts. They run a number of training courses, from a novice who is interested in getting a basic licence to pilot achievement courses. They even boast of a balloon

simulator, which although will not directly lead to a pilot's license, it can give participants a degree of the sensation enjoyed by professional balloon pilots.

Complete the sentences below. Choose NO MORE THAN TWO WORDS from the passage for each answer.

Per Lindstrand accompanied Richard Branson on the longest balloon (1) _____

(2) _____ follows a hot air balloon's flight to retrieve the craft when it lands.

(3) _____ can give newcomers to the sport some idea of the feeling of flying a balloon.

Illegal Downloads

A. Downloading music from the internet has become a simple, fast and easy thing to do. The correct or legal way of going about it seems to be ignored by those who find it too costly. Illegal music downloads have reached an all time high, and a recent survey of high school students revealed an estimated 3.6 billion songs being downloaded per month. There are now endless possibilities available to the public where music can be downloaded for free and people are choosing to take this route even though it is illegal. iTunes is one of the most well known sites where music can be bought legally for just over 51 per track. So when it is this cheap, why are people still going to alternative unauthorized sites? Or is the legal route still considered a costly way to go about it?

B. If you think that copying music results in simply a slap on the wrist, think twice. Under government law, record companies are entitled to \$750 to \$30,000 per infringement but the law allows the jury to increase that to as much as \$150,000 per song if it finds the infringements were deliberate. The music industry has threatened about 35,000 people with charges of copyright infringement over the past decade. In recent months there have been more cases of music piracy heading to the courts. The industry estimates that more than a hundred of these cases remain unsettled in court,

with fewer than 10 offenders actively arguing the case against them. The penalties for breaching the copyright act differ slightly depending upon whether the infringing is for commercial or private financial gain, with the latter punishment being far milder

C. Nonetheless, the potential gain from illegal downloading versus the punitive measures that can be taken are. In many cases, poles apart. Recently, an American woman shared 27 illegally downloaded songs with her friends and was ordered to pay \$1.92 million to the record company for deliberate infringement of the companies' copyrights. More recently in America a 12 year old girl was sued for downloading music illegally and could face a penalty of \$1150 per song. The order of payment from the courts to the American woman who shared the 27 tracks with her friends has spurred controversy as the public disagree with the ordered infringement. The woman shared 27 songs at \$1.99 per song, so should she be liable to pay such a large and impossible amount?

D. It has also been noted that of all measures that can be taken, fining is actually the least likely method of preventing further abuse. With driving, for example, statistics have shown that those that repeatedly drive over the speed limit are not discouraged by the loss of a sum of money, but this attitude quickly changed when the penalty was possibly losing their driving licence or even spending time in prison.

E. Being a difficult thing to police, the music industry has decided that it would be much easier to go after the internet service provider than to try and track down each individual case. The music industry feels internet piracy has decreased their artists' sales dramatically and is a danger to their business, although on the other hand, online music sales promote individual tracks to be sold rather than albums, therefore increasing the amount spent by the purchaser.

F. If there are so many issues around the downloading of music, you might wonder why sales of MP3 players and CD burners are increasing rapidly. The answer is simple – these devices do have a legitimate purpose defined as 'fair use'. You can choose to make your personal back-up copy to use in a MP3 player, or you may visit one of many web sites, like iTunes, which offers music that you pay for as you download. While some may wonder why you would pay for something that can be had for free, those who do

prefer to obey the copyright protection laws have purchased over 150 million songs from the iTunes site alone.

G. Online music sales are a business just like any other and music companies are fighting to salvage their industry. Cary Sherman, the President of RIAA (Recording Industry Association of America), stated that when your product is being regularly stolen, there comes a time when you have to take appropriate action. At the same time, the RIAA has offered amnesty to the illegal downloader who decide to come forward and agree to stop illegally downloading music over the Internet. People who have already been sued are obviously not eligible for amnesty.

H. When high school students were asked how they felt about the business of downloading illegally from the net, they appeared to be divided on the issue. Some seemed to think there was absolutely nothing wrong with it, others felt that it should be thought of as a serious crime like any other form of theft.

Complete the sentences below. Choose NO MORE THAN THREE WORDS AND/OR A NUMBER from the passage for each answer.

1. The maximum fine that a record company can impose is (1) _____.
2. The penalty for breaking copyright laws is harsher when undertaken for (2) _____ benefit.
3. The music industry targets each (3) _____ rather than each specific person downloading illegally.
4. Appliances used in connection with illegal downloads are sold under the term (4) _____.

Clinical Trials

A. The benefits of vitamins to our well-being are now familiar to most; however, when the link between diets lacking in citrus fruits and the development of the affliction ‘scurvy’ in sailors was first discovered by James Lind in 1747, the concept of vitamins was yet to be discovered. Scurvy, which causes softening of the gums, oral bleeding and, in extreme cases, tooth loss, is now known to present as a result of lack of Vitamin C in the diet. Additional symptoms include depression, liver spots on the skin – particularly arms and legs – loss of colour in the face and partial immobility; high incidence of the ailment aboard ships took an enormous toll on the crew’s ability to complete essential tasks while at sea.

B. Suggestions that citrus fruit may lower the incidence or indeed prevent scurvy had been made as early as 1600. It was Lind, however, who would conduct the first clinical trial by studying the effect within scientific experimental parameters. However, while the correlation between consuming citrus fruit and avoidance of scurvy was established, the preventative properties were attributed to the presence of acids in the fruit and not what would later be identified as vitamin content.

C. Lind’s subjects for his trial consisted of twelve sailors already exhibiting symptoms of scurvy. These individuals were split into six groups; each pair common diet. Pair 1 were rationed a daily quart of cider, pair 2 elixir of vitriol, pair 3 a given quantity of vinegar, pair 4 seawater, pair 5 oranges and a lemon and pair 6 barley water. Despite the trial having to be aborted after day five, when supplies of fruit were depleted, the findings of the interventional study showed that only the control group who were given fruit supplements showed any significant improvement in their condition (one had, in fact, recovered to the extent that he was fit enough to return to work). The immediate impact on sailors’ health and incidence of scurvy on board ship was, however, limited as Lind and other physicians remained convinced that the curative effect was acid based. Therefore, while consumption of citrus fruit was recommended, it was often replaced by cheaper acid supplements. The preventative Qualities of citrus fruit against scurvy

were not truly recognised until 1800, though throughout the latter part of the 1700s, lemon juice was increasingly administered as a cure for sailors already afflicted.

D. Nowadays, the implementation of findings discovered in clinical trials into mainstream medicine remains an arduous and lengthy process and the clinical trials themselves represent only a small stage of the process of developing a new drug from research stage to launch in the marketplace. On average, for every thousand drugs conceived, only one of the thousand actually makes it to the stage of clinical trial, other projects being abandoned for a variety of reasons. Stages which need to be fulfilled prior to clinical trial – where the treatment is actually tested on human subjects – include discovery, purification, characterisation and laboratory testing.

E. A new pharmaceutical for treatment of a disease such as cancer typically takes a period of 6 years or more before reaching the stage of clinical trial. Since legislation requires subjects participating in such trials to be monitored for a considerable period of time so that side-effects and benefits can be assessed correctly, a further eight years typically passes between the stage of a drug entering clinical trial and being approved for general use. One of the greatest barriers to clinical trial procedures is availability of subjects willing to participate. Criteria for selection is rigorous and trials where subjects are required to be suffering from the disease in question, experience tremendous recruitment difficulties as individuals already vulnerable due to the effects of their condition, are often reluctant to potentially put their health at higher levels of risk.

F. Clinical trials are conducted in line with a strict protocol and the stages of a trial are generally defined by five distinct phases. A drug that is deemed safe and effective enough to reach the end of stage three is most often, at that point, approved for use in mainstream medicine. Phase 0 involves a first-in-human trial (usually conducted using a small population often of fifteen subjects) with the purpose of ascertaining that the drug's effect is, in fact, the same as predicted in pre-clinical studies. If no concerns are raised, the drug then enters Phase 1 of trial where a modest selection (usually between twenty and eighty subjects) of usually healthy volunteers, is exposed to the drug. However, for HIV and cancer drugs, this stage is conducted using patients suffering from the condition in question. There are two main variations of Phase I testing, these

being SAD (single ascending dose) and MAD (multiple ascending dose). The former involves a single administration of a drug at a predetermined level to one group of subjects, and the second involves administration of a predetermined sequence of dosages.

G. Phases 0 and 1 are geared towards establishing the safety of a pharmaceutical and once this has been confirmed, drugs pass into Phase II testing where, while safety continues to be monitored, the drug's effectiveness is also assessed using a larger group of subjects, ranging from twenty up to three hundred. In some trials, Phase II is regarded as involving two sub-stages, in that Phase II(a) may be concerned with establishing optimum dosage levels and Phase II(b) to evaluate effectiveness. Phase III is the most expensive, time-consuming and complex stage of the trial process, often involving as many as 3000 patients. At this stage, a new drug's effectiveness is rigorously tested and compared to that of the best of the existing alternatives already approved and in common use. Where research indicates that a pharmaceutical has passed all requirements of Phases 0, I, II and III, submissions to relevant regulatory and licensing bodies are then made.

H. The final phase of clinical testing, Phase IV, is conducted over a lengthy period of time post-launch for general usage. This stage is, in essence, a safety net which involves continued monitoring of the drug, its properties and side-effects through which any long term adverse reactions, which remained undetected in the pre-launch clinical testing time frame can be discovered. Identification of harmful effects at this stage, on occasion, has led to withdrawal of a drug from the market; for example, as was the case with cerivastatin, a cholesterol-lowering drug, which was later found to have an adverse effect on muscle reaction which, on occasion, had fatal consequences.

Complete the sentences below. Choose NO MORE THAN TWO WORDS from the passage for each answer.

1. In advanced cases of scurvy, sufferers may experience _____ along with numerous other symptoms.

2. Fruit acids were mistakenly heralded as having _____ in incidents of scurvy prior to the identification of vitamins.
3. Lind's subjects for the first clinical trial were seamen who were at the time of _____ the condition in question.
4. All groups in Lind's experiment were given a _____ along with specific rations which were varied for each control group.