

TOPIC: TRANSPORT

Definition of Transport

Transport is the movement of people and from one place to another.

Transportation is usually classified by the medium in which the movement occurs. For example, land, air and water transport.

Transport can be categorized into traditional and modern means.

Traditional means of transport.

The means of transport at this category were land and water evolved.

i. Land transport.

People move on land either by walking or by using other human powered transport. People also use domestic animals as a means of transportation

ii. Human transport.

Human powered transportation included carrying goods on their backs, heads and shoulders.

Africans were used as porters during the slave trade. Human portage still goes on in the modern society.

Limitation of human portage.

- a. Human portage was cumbersome, slow and tiresome.
- b. Humans Carry limited amount of goods at particular time.
- c. It is not convenient over long distances.

iii. Animal transport.

Early human beings used the domesticated animals to carry loads on their backs or pull carts.

Such animals are referred to as pack animals.

In 500 AD a padded collar was devised that rested on the animals' shoulders. In 200 AD saddles were introduced in Egypt. Horse shoes were introduced in 700 AD

Donkey\Ass.

The first animals to be used as pack animals; they were used in Egypt as early as 3400bc to carry weight upto 80kg. They were commonly used in the trade between Nubia and South Sudan. In Ukambani today, donkeys are used to fetch water.

Oxen.

Referred to as draught animals used for ploughing and pulling carts and also transportation of goods and people.

Horses.

They were first rode but were later trained to pull wagons, chariots and passenger coaches. In the Roman empire, they carried soldiers during war. (Soldiers on horseback are referred to as cavalry.

Disadvantages of horses.

- i. It is highly susceptible to diseases.
- ii. It cannot survive in tsetse fly infected areas.
- iii. The weight limit of the load it can carry is 120kg
- iv. They are not suitable in arid and semi-arid areas because they need a lot of water.

NB; - horses are mainly reared by the rich as a symbol of high social status.

Mules.

A crossbreed of a horse and a donkey, they are sterile and carry loads upto 110kg. they are mostly used in mountainous areas in central and southern Europe and in Mexico.

Camels.

It is referred to as the ship of the desert.

What makes a camel ideal in desert transport?

- i. It has a unique ability to survive for long without food and water.
- ii. They have an incredible water storage capacity, they do not sweat lose much moisture.
- iii. They have broad padded, two toed feet ideal for walking on desert sand.
- iv. The nostrils have flaps which keep away sand during sandstorms.
- v. Its fur is thick enough to protect it from the sweltering desert heat by day and extreme cold conditions at night.

- vi. The hump contains a lot of fat which the camel uses when it goes without eating. Camels were commonly used during the trans-Saharan trade. They are in use in Kenya today among the Galla and Somali carrying weight upto 200kg.

Llamas and alpaca.

Members of the camel family found in central and south America. They carry load upto 40 kg.

Elephants.

They are used in Asia to carry people and heavy loads upto 250kg. In India, they were used to transport people and goods during war in 2500BC.

In Africa they were used in warfare in 270BC.

Water Buffalo.

A member of the cattle family and the only type of buffalo that has been domesticated. The cape buffalo of Africa and the Pygmy buffalo of Philippines have not been domesticated. It is used to pull ploughs and do other heavy work in India and south East Asia.

Reindeer.

A long-horned deer family breed used in the cold parts of Canada, Sweden and Norway for riding and transportation. It also provides milk, meat, hides and horns.

Dogs.

Dog types like Bouriers were used to pull small carts and sledges, especially in the Arctic thus making transportation of gods and people easy. Dogs are also used in guiding blind people in sports and as pets at home.

Advantages of animal transport.

- i. Pack animals can be used in largely inaccessible areas. The Llama, for example is used in the mountainous areas with narrow and meandering paths and steep cliffs. The camel is well adapted for deserts.
- ii. Animals are cheap to maintain. They attract very little maintenance costs, since only feeding costs are incurred.
- iii. Pack animals are safe as accidents are rare probably because they do not speed.
- iv. Animals help to maintain the ecological balance since they do not interfere with the environment.
- v. Pack animals are capable of sensing danger. For example, horses and dogs can sniff out an enemy from a distance. This enhances security as dangerous confrontations with an enemy can easily be avoided.

Disadvantages of animal transport.

- i. Animal transport is slow and tedious. The animals need to feed and drink along the way.
- ii. Pack animals may be attacked by wild animals, disease-causing insects such as tsetse-flies and disease.
- iii. Their movement is limited to the day only and cannot travel at night.
- iv. They can only carry small loads as compared to vehicles.
- v. Some pack animals such as donkey are stubborn when tired and heavily loaded. The camel is only suited for the desert.
- vi. Pack animals use is limited to short distances as they fatigue when they travel for long.

The wheel.

The wheel was invented in sumeria at about 3000bc. By 2500BC, they had invented the spoked wheel used on horse drawn chariots. The chariot was used in Mesopotamia at around 2000BC and later spread to Egypt, Persia, Rome, china, Africa and Europe.

The cart or wagon pulled by humans or animals was the first wheeled vehicle. The wheeled wagons and carts created the need for roads

Today many types of wheels are in use. For example, the steering wheel for cars, turbines for jet engines and gyroscopes used in the automobile pilot technology.

Ways in which invention of the wheel impacted on road transport

- i. More roads were constructed to use wheel vehicles for transport
- ii. Road transport became faster and efficient
- iii. Bigger loads could be carried hence was cost effective – profitable

- iv. It made the use of motor engine driven vehicles possible
- v. It enabled man to move over long distance to disseminated ideas and interact.

Water transport.

Water transport has progressed from early rafts and canoes to the modern large passenger and freight ships.

Rafts.

A raft is a simple floating structure, usually made by tying together floating material like animal skin, papyrus stalks or logs

The earliest people to make rafts were the Australians. They made rafts called catamaran by tying logs together. Long poles were then used to drive the raft.

Rafts however sank easily and required a lot of manpower upstream.

Canoes.

A canoe was a narrow boat that was propelled by one or more paddles. The oldest canoe was made by stripping the bark from trees (bark canoes). Later a new canoe was made from a hollow on a log (dug-out canoe)

In Kenya, canoes are used for transporting people and goods and for fishing in inland lakes and rivers.

Oar-driven boats.

Boats are small vessels for travelling on water and are powered by oars, sails or motor. The Egyptians pioneered in the building of boats that used oars (a short wooden pole with a flat end) instead of paddles in 3000BC. The Phoenicians, Greeks and the Romans developed oar-driven trading vessels and warships.

Sailing ships.

Humankind learned that the wind could move a boat more easily than human beings if the ship had a piece of cloth fixed on poles (sail). The Egyptians used the sailing ships by 3000BC on the Mediterranean and Red seas. The Greeks made sailing ships known as galleys which were used for trade and war. They used war galley known as triremes to defeat the Persians and Phoenicians.

Sailing ships were depending on monsoon winds discovered by Hippalus. The Arabs and Persians relied on the monsoon winds to reach the east African coast. The Portuguese invented a three-masted ship called a caravel as the one used by Christopher Columbus and other explorers to sail to America and the Far East. The Carrack used by Vasco da Gama was five-masted to sail to east Africa. Ferdinand Magellan became the first person to sail

around the world using a Sailing ship. Fast sailing ships called clippers were made in 1840s in America. It was a long and narrow ship with sharp bows and almost straight sides. However, sailing ships could not sail on windy days and seasons. Some communities however still use sailing ships upto today for sports, fishing and leisure.

By the 12th c AD, the magnetic compass was being used in navigation aid

Factors that led to the development of various forms of transport

- i. Technological development during the scientific age which enabled man to invent machines which could be used to manufacture various parts of cars, rails, airplanes, ships and motor boats.
- ii. Expansion of geographical knowledge encouraged the development of transport so as to enable man to search new places faster and more safely.
- iii. Introduction of specialization as a means of production which necessitated exchange of goods and services which could only be made possible through development of transport and communication.
- iv. Population increase hence demands for more food and goods hence the need for essential transport system.
- v. In order to satisfy the desires of man there was need to develop a system of transport that would enable man to get the goods and services he needed so much.

MODERN MEANS OF TRANSPORT.

Road transport.

The invention of the wheel stimulated the construction of roads. The Roman soldiers built hard and straight roads all over Europe and North Africa by around 300 BC. The roads were built by digging a trench, 1.5metres deep which then would be packed with heavy stones or rocks. Rough and fine concrete

was added to the foundation, then layers of gravel, chalk and cement. The road surface was slightly convex with deep trenches on the sides. Roman roads declined with the fall of the Roman Empire. Attempts to built better roads in Europe in the 18th c were made by George Wade (1673- 1748) built 400km of roads and John Metcalfe (1717-1810) built 290km of roads. However modern road construction is attributed to John McAdam (1756-1836). McAdam laid three layers of small broken stones packed tightly together. He then placed a layer of gravel which was bound together by the weight of a vehicle. These roads were called the flexible road or macadamized road. These roads were straight and had a smooth surface. They were widely used all over the world. They have curved surfaces and had a Good drainage system. They are cheap and durable. The roads were later improved by adding tar to produce a water proof surface called tarmac. By 1820, Britain had built 200,000km of road.

Advantages of macadamized roads.

- i. They were durable with three layers of small broken stones
- ii. They were cheap to construct using stones as the basic material for construction
- iii. They had a smooth motoring surface since the gravel layer was bound together by the weight of vehicles
- iv. They were straight hence reduced occurrence of accidents
- v. They were easily drained due to their smooth surface and being raised.

The bicycle.

In 1790, a Frenchman, de Divrac made the first bicycle which was pushed with the feet thus called a walkalong.

A german named Baron Karl Drais invented a walkalong called draisine which had a steering bar connected to the front wheel .

In 1860, Ernes Michaux, a French locksmith, invented a bicycle with two wheels and pedals attached to the front wheel.

In 1866, Piere Allement a Frenchman, was given the first patent on a bicycle, boneshaker. It had iron wheels fixed to wooden spokes.

In 1873, a bicycle named a high-wheeler was introduced in England. The firs bicycle in England was made by Kirk Patrick Macmillan of Scotland.

James Starley is referred to as the father of the cycle industry. In 1870, he invented the tension spoked wheel in which the rim and the hub were connected by wire spokes.

John Dunlop invented the tyre filled with compressed air in 1888 which replaced the iron tyres and solid rubber tyres.

In 1893, a bicycle with a diamond shaped frame with a roller-chain-drive and a compressed air wheel was invented.

The bicycle is today used all over the world not only for transport, but also for sporting and leisure activities. The advantage of a bicycle is that it easily used on narrow paths and on a fairly level surface. It is also cheap and convenient.

Motor vehicles.

These are self-propelled power-driven land transportation devices used to transport people or goods, especially on land. The device converts fuel into energy to provide the power for the vehicle to move. The first attempt to power drive devices was the suggestion by a Swiss clergyman J.H Genevois in 1760 that wind springs be used to move wheels on roads. However the making of an engine that could drive a vehicle is attributed to a French engineer, Nicholas Joseph Cugnot (1725- 1804). He built a three wheeled steam-driven vehicle in 1769, though he abandoned his experiment prematurely.

In 1883, a German, Gottlieb Daimler (1834-1900) produced a high speed petrol engine which he fitted on a wooden cycle in 1885. Karl Benz (1844-1929) fitted the same engine on a w tricycle in the same year.

In 1886, Daimler made the first petrol driven car with four wheels. Benz built the first four wheeled Benz car in 1893. In the same year, an American, Charles Duryea (1862-1938) built the first gasoline powered automobile. The tyres made by Dunlop were fitted on these cars to make them more comfortable.

The first car in the motor industry, *Panhard-Hevassor*, was made by a French company which had bought the rights to use Daimler's engine.

In 1903 in USA Henry Ford founded the Ford Motor Company in Detroit leading to mass production of cars in the world. For example the model T Ford was developed in 1909.

Students read more on the motor vehicle inventions.

Impact of road transport.

- i) Roads have promoted trade within and between countries since goods are transported by road to various markets. This case is true in east Africa.
- ii) Road transport has stimulated industrial development as raw materials to factories and manufactured goods to the market are easily transported.
- iii) Development of towns and urban centres along roads has been as a result of improved road transport.
- iv) Many countries earn a lot of foreign exchange from the sale of motor vehicles. For example Japan, Germany and USA.
- v) Employment opportunities are created as many people work in the motor vehicle industry while others are employed to construct and maintain roads.

Advantages of road transport.

- i) Since it is the commonest mode of transport, it reduces the cost of movement of goods and people as well as promoting social interaction.
- ii) It is cheaper compared to other forms of transport. Roads are easier to construct and maintain when compared to railway transport.
- iii) It is faster when compared to water and railway transport unless in the case of electric trains.
- iv) Roads are flexible and link with other forms of transport such as water, railway and air.

Disadvantages of road transport.

- i) The high number of accidents on roads leads to loss of lives.
- ii) Road transport is responsible for pollution which causes environmental degradation.
- iii) Due to an increased number of vehicles on roads, traffic congestion is a major concern in most urban cities and towns.
- iv) Roads may sometimes inconvenience the users when they become impassable.
- v) The quantity of goods carried is limited as roads cannot carry bulky goods compared to the railway.
- vi) The use of roads is limited to specific areas. It cannot go beyond land e.g across the sea or lake.
- vii) Construction of all-weather roads is expensive. Developing countries find themselves constrained by limited resources that are needed to construct all-weather roads.

Rail transport.

Railway lines are paths of parallel metal rails that allow a wheeled vehicle to move easily by reducing friction. Initially, they were used in 1800s to guide horse drawn wagons. Later the steam engine replaced horses as the means of transport.

The development of modern railway was a gradual process that started in Britain and Germany with the use of wooden rails.

A British engineer, Richard Trevithick (1771-1833) designed a steam engine that was small enough to be put on a truck. This he fitted on a railway locomotive which he had bought in 1804 to pull a cargo and passenger train in south Wales.

Fenton, Murray and Wood of Leeds built the John Blenkinsopp locomotive in 1812.

William Hedley built the puffing Billy in 1813.

George Stephenson (1781-1845) a coal miner in Newcastle, England invented a locomotive engine called the Blucher which pulled eight laden wagons in 1814. He also built the world's first public railway between Stockton and Darlington near Durham in 1825.

In 1829, Stephenson and his son, Robert, built the most improved engine, the rocket, which had a speed of 48 km per hour. In 1830, he built the Northumbrian and the planet.

In 1825, in the United States, Colonel John Stevens built a tiny experimental locomotive. In

1929, a major railway was built by the Delaware and Hudson Canal Company to serve a coalmine. Germany and Belgium had railroads by 1835, Russia by 1837, Spain by 1848 and Sweden by 1856. In 1892, a Germany Rudolf Diesel designed a heavy oil-driven-engine which replaced the steam engine. It was cheaper and efficient

The first diesel railcar was used in 1913 in Sweden. Later diesel engines were replaced with electric engines which was an invention of the Siemens Brothers and John Hopkinson in Britain in 1883. The electric train from Paris to Lyon covers a distance of 212 km in one hour.

Railway transport has remained a major mode of passenger travel. In Europe and Japan, major cities are connected by high speed passenger trains such as the French TGV (Train a' Grange Vitesse) and the Japanese Shinkansen trains travelling at a speed of 300km/h.

Results of railway transport.

- i. It has promoted the movement of people thus leading to increased social and cultural interaction. People can migrate easily in Europe thanks to the faster electric trains.
- ii. It has promoted trade as goods, light, heavy or bulky, are transported efficiently to the markets. It also supplements the use of other forms of transport.
- iii. It has stimulated industrial development since industrial products and raw materials can now be transported faster and in large quantities.
- iv. Railway transport has stimulated the growth of urban centers. In Kenya for example, urban centres like Nairobi, Kisumu, Mombasa and voi either developed along the railway line or at the terminus.
- v. It has facilitated the spread of religious faiths and political ideas. This was the case in Kenya during the period of missionary work and colonization. In a way railway transport therefore facilitated European occupation of overseas colonies.
- vi. There has been a significant improvement in agriculture since agricultural goods are transported more easily and faster using the railway.
- vii. It has been a source of employment for many people I maintenance, engine driving etc.
- viii. It has facilitated the exploitation of natural resources like mining, fisheries and forestry. The raw materials from these resources are transported faster using the railway.
- ix. Railway transport has stimulated economic growth since it is a source of revenue for many governments.

Disadvantages of railway transport.

- i. It is expensive to construct. The wagons are also expensive to buy and maintain.
- ii. Railway transport lacks in flexibility. It can only pass through certain landscapes.
- iii. Smoke emitted from the trains lead to environmental pollution.
- iv. Railway accidents might be rare but when they happen, they are fatal. This was the case in Kenya in 1998 when 200 people lost their lives.
- v. Railway transport is not self sufficient. T has to be supplemented with road transport.

Water transport

Canal vessels.

A canal is an artificial river that is used to transport people and goods. It may be built to link a ricer and a lake, sea or a sea with a sea. Apart from transportation, their water may be used in irrigation like in the case of River Nile. Canals have been used for centuries for transportation. The earliest canal was built by the

Europeans nearly 4000 years ago to link the river Nile and the Red sea.

The longest canal, the Grand Canal in china is bout 1900km long and it links the Yangtze and Yellow rivers.

Canal building in Europe was pioneered by the Romans who built them for transportation, irrigation and drainage. The Dutch, British and the French also constructed elaborate canals

Canal building in the US began in 1817 and ended in 1825 with the construction of the Erie Canal which is 845 km long connecting Hudson River with Lake Erie. It is now known as the New York State Barge. Upto 1840, 4,800 km of canals had been constructed in USA.

Another type of canals is the ship canals, for example the Suez Canal, Panama Canal and Kiel Canal, which are deeper. The Suez Canal in Egypt is 195 km long and links the Mediterranean Sea with the red sea. It was constructed between 1859 and 1869 by a French company under Ferdinand Lesseps. The Kiel Canal links the North Sea and the Baltic Sea. The Panama Canal was built by the USA Government between 1904 and 1914 linking the pacific and Atlantic oceans. It is the most important canal as it shortened the long and dangerous trip around the southern tip of south Arica. The St. Lawrence Seaway is the longest and most important inland waterway system in North America. It is 3,800 km long and was completed in 1855 in USA and 1895 in Canada.

Steamships.

Steamships were made after the invention of the steam driven engine. The first attempt to make a steamship was made by Dr. Denis Papin of France when he fitted a steam engine to a boat and sailed along river Fulda in Hanover.

In 1736, Jonathan Holls of Gloucestershire patented a steam tugboat but it was never tried.

In 1774, Comte J B d' Auxiron of France experimented with a steamboat but also failed like Papin as it broke down.

In 1775, C Perier became the first person to move a small boat powered by steam engine o river Seine in Paris.

The first successful steamboat was built and tried out in 1783 by a Frenchman called Marquis de Jouffrey on River Saone near Lyons in France.

In America, John Fitch built a steamboat in 1787. It was used on river Delaware between Philadelphia and Trenton

In 1809, William Symington and Miller Pat succeeded in constructing a wooden steamship that was used on the Forh-Clyde Canal in southern Scotland.

In 1807, in America, Robert Fulton had invented a double –paddle-wheeled steamboat known as Clermont which began operating on the Hudson River.

In 1807, the phoenix became the first steamship that made regular voyage from Philadelphia to New York.

In 1819, the savannah became the first ship equipped with a steam engine to cross the Atlantic Ocean.

In 1853, the peninsular and oriental Line built the iron-screw steamer, Himalaya, the biggest vessel as at that time.

John Elder invented a compound engine with two cylinders which reduced fuel consumption in steamships.

In 1838, Sirius sailed from London to New York, the Great Western, without using sails crossed the Atlantic in 15 days from Bristol.

In 1839, the Archimedes and the Robert F Stockton were built using Smith's and Ericsson's patent.

The most important ship to cross the Atlantic was the Great Britain built by the Islamabad Kingdom of Brunei in 1843.

The first USA trans-Atlantic steamers were the Herman and Washington.

The first merchant ship to be all-welded without any rivets in its hull was the MS Fullagar in 1920.

Importance of the discovery and use of the steamship.

- i. Man could no longer depend on nature –wind for power. This made travel by sea easier and more comfortable.
- ii. It led to expansion of international trade since transportation became cheap.
- iii. Bigger volumes and varieties of goods could be carried including those that required special handling like petrol.
- iv. It formed the basis for colonization as colonizers could move to other continents easily.
- v. It increased international migrations and spread of races , cultures, diseases , intermarriages, languages and religion
- vi. It led to greater expansion of geographical knowledge. It gave access to countries bordered by sea.

vii. It led to expansion of world economies, industries, trade and commerce.

viii. Spread of plants and animals internationally.

Motor- Driven ships.

With the invention of the internal combustion engine, oil replaced coal. The *Caspian Steamer Wanal* was built in 1903 was the first sizeable ship with an internal combustion engine.

In the 20th c, the use of atomic energy (nuclear power) was developed. The first ship to use atomic power was the *Nautilus* in 1956. In 1961, an American merchant ship, *MV Savannah*, propelled by nuclear power was launched.

There are two types of ships based on the service offered;

a) *The Liners* operate regular scheduled services on defined trade routes charging advertised rates.

b) *The Tramp* ships carry any suitable cargo between any two points based on a negotiated contract. They have no regular route or timetable.

Modern passenger Liners.

The cruise ship, the most important passenger liner, is a specially designed vessel providing luxurious surroundings and entertainment to passengers. It is about 270 m and carries 2000 passengers.

New passenger Liners were developed after World War II for example the *American United States* of 1952 and the *British Queen Elizabeth 2* of 1969.

The liners were overtaken by the development of the aeroplane and airline transport and only a few remain today.

Freight Vessels.

These are Special Ocean going ships designed for carrying large amounts of cargo.

Containerships transport large metal containers that have been pre-loaded with cargo. Some container ships carry over 6,800 containers.

Military Vessels.

In 1859, the French launched *Gloire*, the first iron-plated ship. During the American civil war (1861-1865), two iron-plated ships were used.

In world war II, battleships, Aircraft carriers (can carry 85 aircrafts) , cruisers, destroyers, destroyer escorts (frigates), minesweepers, torpedo boats, landing craft and other support vessels were developed.

Hydrofoils and hovercraft.

These are specialized water vessels (*a hydrofoil has small wing-like surfaces called foils attached to the bottom of its hull that lifts the hull out of water when the hydrofoil accelerates. A hovercraft is lifted entirely off the water surface by a cushion of air and are propelled by giant air propellers or by water jets*)

Ferries.

These are vessels used to transport people, animals and vehicles over water in places where bridges would be inconvenient or impossible to build.

Motorboats and personal craft.

These are small boats that are used for recreational purposes with either out boat motors or in boat motors.

Pipeline transport.

This is a form of transport used to move liquids, gases or solid liquid mixtures over long distances. The most common liquid that is transported by pipeline in many countries is water.

Others are oil and gas. Pipelines are also used to transport solids suspended in liquids such as coal slurry which consists of powdered coal suspended in water.

Air Transport

This is the fastest form of transport over long distances and continents. Different types of Aircraft exist.

Aeroplane.

An airplane is an aircraft heavier than air that uses wings to obtain lift in order to fly thus transporting people, mail and cargo from place to place. They are also use in warfare.

The development of an aeroplane started in 1783 when a successful manned flight was made in France by two brothers, Jacques and Joseph Montgolfier using a hot air balloon.

Sir George Cayley, an English scholar and inventor, built model Gliders that could sail in the air in the 19th c. Later, Pilcher added wheels to the gliders in order for them to be towed into the air. By 1850, power driven planes were built. An English engineer, John String built and designed power-driven planes. In December 1903, An American astronomer, Samuel Langley almost won the honour of perfecting the power driven airplanes, by making a full size airplane called the aerodrome. The plane unfortunately crashed in Potomac River before being launched.

On 17th December 1903, two weeks after Langley's failure, the Wright brothers, Orville and Wilbur Wright, produced the first manned power driven aeroplane at Kitty Hawk, North Carolina USA. Their machine was a wooden glider fitted with a petrol engine and two propellers.

In 1906, a Brazilian-born aviation pioneer made the first officially observed European flight in a powered bi-plane.

In 1909, Louis Bleriot of France became the first person to fly a plane across the English Channel in 35.5 minutes.

In 1915, the Germans used the first mono-plane during the First World War.

In 1919, John N. Alcock and Arthur W Brown flew non-stop across the Atlantic from New Foundland to Ireland.

Later improvements in the plane were replacement of wood and cloth with aluminum and stainless steel, invention of a retractable gear that improved streamlining in planes

By 1920, plane speed had gone up to 303 km /h. in 1940; it was 755 km/h.

The best known aviator in 1920s was Charles Linburgh who accompanied a non-stop flight from New York to Paris in 1927 in his single monoplane called the spirit of Saint Louis in 33 hours.

In 1920, the first scheduled passenger service was made between Amsterdam and England by KLM Dutch Airlines.

In 1930, the first pressurized plane was launched. The most popular passenger plane at that time was the DC-3 built by Douglas Aircraft Company.

It had a capacity of 30 people and moved at a speed of 320 km.

The jet engine.

The jet engine was invented by German engineers in 1939. the first jet powered airplane was the german Heinkel HE -178. The first practical jet fighter was the Lockheed P-8 developed in 1944.

During the post war period, the jet engines were put to commercial use. For example, the Boeing 707 flight which was launched in 1958 in USA. The Boeing 747 Jumbo Jet which entered the market in 1970 can carry 375 passengers, 20 tonnes of freight and move at a speed of 900 km/h.

The Supersonic Loans Port (SST) is designed to fly at speeds of over 1180 km/h. the Russian TU-144 and the French – British Concorde are both SSTs and entered passenger market in 1972.

Helicopters.

It is a type of airplane which obtains its lift from a set of rotor blades rather than fixed wings.

The first successful helicopter was made in 1907 when a French helicopter left the ground for a few seconds.

Germany made the first practical helicopter in 1936 while the United States Army unveiled its wartime helicopter in 1942.

Uses of helicopters.

Lighter- than-air-vehicles.

These include balloons relying on hot air and lighter than air gases like helium and hydrogen for lift. Airships that combine lighter than air gas bags with propellers navigation were initially used for passenger traffic but their usage declined due to several fatal accidents. For example the disaster that befell the german airship, *Hindenburg*, in New Jersey in 1937.

The rocket engine.

Rocket engines use fuel. They carry chemicals which enable them to burn their fuel without air supply.

The first rocket engine to be used was by a german manufacturer, Fritz von Opel in

1930. An American, R H Goddard also developed a modern rocket in Massachusetts in the USA.

Factors which encouraged the development of air transport.

- i. The effect of the First World War- it increased demand of war planes-jet fighters and fighter planes flying over 600kph were manufactured.
- ii. The arms race and the cold war which also made many countries to acquire many planes.- fear , jealousy and competition based on ideological differences.
- iii. Desire for comfort among passengers and the need to transport perishables quickly.
- iv. Expansion of international trade and desire for more wealth.
- v. Colonization and international migrations.
- vi. The expansion of the tourist industry.
- vii. Vast improvement in science and technology and growth of industries.

Results of air transport.

- i. Air transport is a major global employer. The air transport industry directly generates 5.5 million jobs globally and contributes USD 408 billion to global GDP. It directly contributed
- ii. USD 1,830 billion to world GDP in 2007 and generated 79 million direct jobs globally – 2.8% of total employment.
- iii. Air transport is an important facilitator of international trade, thereby promoting economic growth and development. Forecasts suggest that the global economy will become even more dependent on trade over the next decade. World trade is expected to nearly double, rising at more than twice the rate of global GDP growth, with China, India and emerging markets leading the way.
- iv. Air transport stimulates Tourism which makes a major contribution to the global economy.
- v. The air transport industry plays a major role in supporting tourism. Over 40% of international tourists now travel by air, up from 35% in 1990. At the same time, the WTTC estimates that foreign visitors account for just fewer than 25% of overall tourism spending around the world. This includes spending by business travelers, as well as those on leisure trips or visiting friends and relatives.
- vi. Air transport is a significant tax payer. Unlike other transport modes, the air transport industry directly pays for its own infrastructure costs. The user charges collected by airport operators pay both for the day-to-day services they provide to airlines and their customers, and also for the massive investment in runways, terminals and other infrastructure required for a modern, efficient air transport service. In addition, companies in the air transport industry make significant tax payments to national treasuries.
- vii. Air transport expands the range of consumer choices and opportunities to visit other countries and to experience new cultures.
- viii. Air transport delivers humanitarian aid. Air services play an essential role in humanitarian assistance to countries facing natural disasters, famine and war – through cargo deliveries, refugee transfers or the evacuation of people trapped by natural disasters. They are particularly important in situations where access is a problem – for example, ‘air drops’ are among the first response of aid agencies to stem a humanitarian crisis.
- ix. Air transport also plays a vital role in the rapid delivery of Medical supplies and organs for transplantation worldwide.
- x. Air transport provides access to remote areas. Air transport provides access to remote areas where other transport modes are limited. Many essential services, such as food deliveries, hospitals, education and post, would not be available for people in such locations without air services. And residents would be isolated from family, friends and business contacts.
- xi. Air transport has improved security as soldiers can be flown to troubled areas. Aeroplanes are also used in espionage
- xii. Air transport has led to improvement f space exploration. Satellites are used to study objects in space such as stars and planets.
- xiii. Air transport has promoted international cooperation and understanding. People from different countries can exchange ideas.
- xiv. It has provides the fastest means of transport for passengers and goods thus increasing cultural and social exchange.

- xv. Aeroplanes are used to break hail in order to cause rain.
- xvi. Plans and other aircraft have added to variety to sporting and entertainment. E.g the staging of fighter plane shows in public holiday celebration.
- xvii. Aircraft has revolutionized warfare especially during the Second World War when countries began using planes in warfare.
- xviii. International terrorism has been facilitated in the recent past by aeroplanes. Incidents of planes being hijacked are becoming common in the world today.
- xix. Air transport contributes to environmental pollution due to waste discharged by the burning fuel. Jets cause noise pollution.
- xx. Air transport has enhanced agriculture as planes are used to spray and dust insecticides on crops in the case of large scale farming. They are also used in quick delivery of perishable farm produce from horticultural farms.
- xxi. Planes assist in fire fighting, inspecting fence lines and power cables and border patrol.
- xxii. Aeroplanes are used in making aerial survey in cartography thus improving map making.
- xxiii. Air transport enhances wildlife management and conservation. Counting of animals by wildlife officers is one used planes.
- xxiv. In meteorology, air transport has enhanced weather survey.
- xxv. Air transport sometimes leads to deaths of many people when fatal accidents occur. For example, the mid-air blow-up of the Trans World Airline plane over the Atlantic Ocean in July 1961.
- xxvi. In 1996, the 5th may 2007 crashing of a Nairobi –bound KQ 507 moments after leaving Duala international Airport in Cameroon killing 114 passengers.

Space exploration

This is the attempt by scientists to reach the heavenly bodies namely the stars and moon to learn more about them and their importance to man as a whole.

Space age refers to the period in which the exploration of space became possible. It began with the launch of the first artificial satellite in October 1957 by the soviet union- Sputnik.

The first human to go to space was a Russian Major Yuri Gagarin using Vostok I in April 1961. In the same year an American, John Glenn also went to space.

Neil Armstrong, an American Became the first man to land on the moon in July 1969 in his space craft, Apollo II. He was accompanied by Edwin E Aldrin Jr and Michael Collins. Many other have toured the moon since then.

Later on a space shuttle was built. The first space shuttle, Columbia, launched in 1981, carried two American astronauts, John W. Young and Robert L Crpens. In 1983, the space shuttle, challenger released a satellite into space. One of the crew members, Sally K Ride became the first woman astronaut to go to space.

In 1984, Kathryn D Sullivan became the first American woman to walk in space.

By 1988, there were 300 operating satellites in space while 1200 were not functioning.

Challenges facing space exploration.

- i. Deadly hazards like cosmetics and solar radiation and micro meteorites dangerous to space craft.
- ii. Hostile natural environment which is unsuitable for human life making it very expensive.
- iii. Extreme temperatures and light intensities. Extreme darkness and brightness.

Such difficulties have been overcome through development of new tools and techniques for space navigation.

Importance of space exploration to man

- i. Spacecrafts continue to provide information about conditions in space in particular about the weather.
- ii. Reports derived from weather satellite can act as warning systems about impending storm.
- iii. It helps us to gain more knowledge about our planet earth. e.g. a scientific satellite known as Vanguard 1 sent back pictures, which showed that the earth was slightly pear-shaped.
- iv. Communication satellites like the Telstra and Relay have made it possible to send television programmes and telephone calls over much longer distances.

- v. In 1965, the US achieved another momentous feat in space communication. The mariner in a deep space probe sent back pictures of mars that were taken as it passed the planet.
- vi. Some space exploration offers possibilities without limit. Planets themselves may have metals and other resources that men on earth need.
- vii. Information about outer space may make it possible to make rain and make long-range weather forecast more accurately than before.
- viii. Some scientists are optimistic that space research might make it possible for human beings to settle on some planets; so far, we are not very definite about this.
- ix. Humankind can benefit from medicine prepared under ideal conditions on the planet namely dust free and germ free medicine.
- x. Space exploration enhances technological development.
- xi. It facilitates own understanding of the universe.
- xii. It leads to improved manufacture of aircrafts, telescope and related machines.
- xiii. Contributed to development of advanced air force weapons.

Advances in transportation

Africa's first high speed train system, *the Gautrain*, was officially lanced in Johannesburg on 8th June 2010 to connect the cities of Johannesburg and Pretoria with a 160 km/h rail service.

Effects of modern forms of transport.

- i. It has made local and international trade more efficient. Trade in perishable goods such as flowers and vegetables have been expanded thanks to air transport.
- ii. Population migration and settlement all over the world has been encouraged using the means of transport.
- iii. It has facilitated the quick transfer of technology and ideas as people interact
- iv. It has made industries more efficient. Raw materials, industrial workers, and manufactured goods are transported to their destinations cheaply and quickly.
- v. It has promoted tourist industry which is a major foreign exchange earner in many countries. Accessibility to tourist attraction sites has greatly improved.
- vi. It has generated employment opportunities to many as road constructors, drivers, pilots and mechanics.
- vii. It contributes additional revenue to the government. Countries charge toll fee, license fee and fuel levy.
- viii. Air transport enhances space exploration.
- ix. Has contributed to the growth of the service sector like banking and insurance.
- x. Transport has promoted humanitarian assistance particularly in disaster situations, e.g distribution of relief food, medical services and evacuations during catastrophes and wars.
- xi. It has led to growth of schools and hospitals and social amenities. In Kenya most schools and hospitals are located along transport routes.
- xii. It has led to agricultural development. Farmers have been able to increase food production since they can transport farm produce and inputs more efficiently and effectively.
- xiii. It has stimulated the growth of urban centres. Towns such as London, Nairobi and Harare started off due to their location along transport routes. The towns have also grown due to their transport function.
- xiv. Transport has enhanced political control in countries. National security has been enhanced due to accessibility of many areas of a nation.
- xv. Transport facilitated colonization of Africa and Asian countries. Railway systems helped them to conquer and suppress local resistances to facilitate easy administration.

Negative effects of transport

- i. Transport systems are responsible for many accidents in world leading to loss of lives. The Mtongwe ferry accident in Kenya claimed 257 lives in 1994; a plane crash in Ngong in 2012 killed the minister for internal security professor George Saitoti and six others.
- ii. Transport is responsible for environmental pollution. Different forms of transport emit poisonous gases to the atmosphere. Oil –tankers cause oil spills in the sea s leading to marine pollution.

- iii. Unless they complement each other, different forms of transport are unreliable. For example, water and railway transport have to be complemented by road transport.
- iv. The growth of international terrorism has been attributed to transport network.