INTO THE MODERN ERA

THE SWINGING SIXTIES

Welcome to the 'Swinging Sixties'– an era of outstanding scientific and technological advance, burgeoning liberalism and moral decline, and the start of economic instability and political challenge. It is a period where, for the first time, the views of the minority were amplified by the media and fed through the television set into every household in the country. Sensationalism became the vehicle for fame and influence, even hysteria, in the quest to push the boundaries towards greater wealth, safety and freedom of expression. Authority teetered and legal restraint was challenged. At street level, however, things were a little less dramatic. With nearly 18 million fewer people and much less traffic, life was quieter, cleaner and less polluted. There was much more respect for people, more trust and neighbourliness and less crime. The streets were safe and children could play outside without fear. But the revolution which unfolded changed lives irrevocably. There were exciting developments on many fronts which enhanced scientific understanding, stimulated innovation, and laid the foundations for the electronic and digital revolution ahead.

The acme of scientific achievement was the conquest of space and the moon landing in July 1969 – the result of 12 years of frenzied competition between Russia and the United States of America to achieve supremacy in the 'Cold War'. Arising from rocket development by the Germans during the 2nd World War, and subsequent research and development in missile technology as tensions between the countries escalated in the 50s, eyes turned heavenward for the next tactical advantage. The race began in earnest on October 4th 1957 with the launch of 'Sputnik 1' – the first successful artificial satellite to be placed in earth orbit. The U.S. were quick to respond and on December 6th attempted a satellite of its own, only to be thwarted when it exploded seconds after take-off in view of a huge television audience. The embarrassment, exaggerated by the media into an international joke with jibes describing the craft as 'Flopnik and Dudnik', ramped up American determination to succeed, no matter what the cost. There ensued years of tit-for-tat missions, each surpassing the other in technological advance. The goal quickly became the conquest of the Moon and the race unfolded as follows.

U.S.S.R.	**U.S.A.**
1957 Oct. 4th Sputnik 1	
Nov. 3rd Sputnik 2 with dog Laika	
	
	1958 Feb 1st Explorer 1
	April 9 Mercury 7 (Alan Shepard)
1961 April 12th 1st human orbit (Gargarin)	1961 May 5th Freedom 7 1st American in space

U.S.S.R.

U.S.A.

1962 Feb 20th 1st human orbit (John Glenn)

1963 June 16th 1st woman in space

1964 Oct 12th Multi person spacecraft

Voshod 1

1965 Mar 18th 1st space walk (Voshod 2)

1965 Mar 23rd 1st multi-person spacecraft

Gemini 3

June 3rd 1st American spacewalk

Dec 15 1st orbital rendezvous

1966 Feb 3rd 1st soft landing on moon

1966 Mar 16th 1st Docking in space

1968 Sept 14th 1st spacecraft to fly around The moon and return

1968 Dec 24th 1st flight around the moon

1969 July 3rd Explosion of N1 Moon Rocket

1969 July 20th 1st humans on the moon

The successful landing of Apollo 11 and the catastrophic set back of the Russian attempt effectively ended the chase for the Moon. The Apollo programme continued on, however, with 5 more missions to the lunar surface.

Apollo 12 Nov 1969 Time outside capsule 7.45 hrs

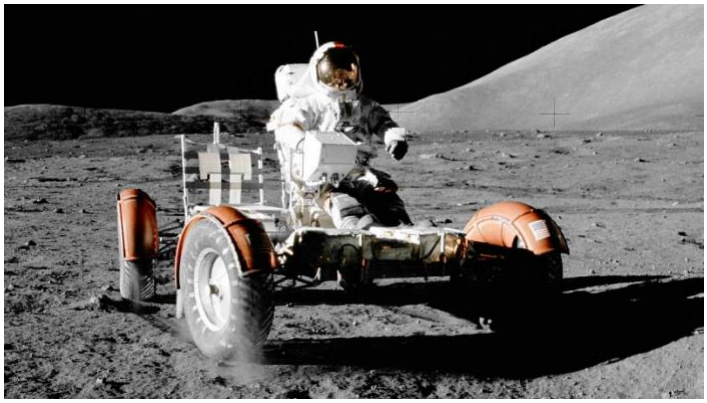
Apollo 13 Aborted mid flight

Apollo 14 Jan. 1971 " " " 9.21 hrs

Apollo 15 July 71 " " " 18.33 hrs Included Lunar Rover

Apollo 16 April 1972 Time outside capsule 20.14 hrs Included Lunar Rover

Apollo 17 Dec. 1972 " " " 22.02 hrs " " "



Space probes were not limited to the Moon. Competition between the U.S.A. and the U.S.S.R. to reach the planets was just as fierce throughout the 60's and 70's.

1960 USSR probe to Mars (missed)	1972 USA 1st mission to asteroid belt
1961 USSR probe to Venus (No data return)	1973 USA 1st Jupiter Fly-by
1962 USSR Mars Fly-by	1974 USA Venus Fly-by (5768 Kms)
1962 USA 1st successful Venus Fly-by	1974 USA Mercury Fly-by (780 Kms)
1965 USA Mars Fly-by (pictures returned)	1975 USSR 1st orbit around Venus
1966 USSR 1st impact on another planet (V)	1975 USSR 1st successful surface photos(V)
1970 USSR 1st soft landing (Venus)	1976 USA 1st successful surface photos (M)
1971 USA 1st in orbit around Mars	1978 USA Multi orbital exploration (V)
1971 USSR 1st impact into Mars	1979 USA Jupiter Fly-by (349,000 Kms)
1971 USSR 1st soft landing on Mars	1979 USA 1st Saturn Fly-by (21,000 Kms)

Man's fascination with the entirely new perspectives of Earth stimulated the development of artificial satellites. Technological advance in Materials, Rocketry, Electronics, Solar Power, Thermal control and Telemetry opened up their potential. By 1980 their capacity to reflect telephone, radio and digital signals had kick started a revolution in communications. Space photography was put to use for map making, weather forecasting and spying of all kinds, and the possibilities for navigation via GPS was beginning to emerge.

Needless to say the cost of these missions was astronomical, the returns, in the short term at least, were minimal. There was no pot of gold at the end of the lunar rainbow, just a few kilos of moon rock and a few photographs and, in the short term, the investment in satellites far outweighed commercial receipts. As global economic circumstances became more challenging in the 70's as the cold war thawed there was a re-evaluation of space exploration. Urgency and competition dropped away to be replaced by co-operation. There was some attempt to ease political tensions as early as 1967 with the signing of an 'Outer Space Treaty' forbidding the placement of weapons of mass destruction in earth orbit, on the moon, or any other celestial body, or using them for any non-peaceful purpose. But this was more to do with mistrust and fear rather than any real attempt at détente. As the emphasis shifted towards exploiting the commercial potential of space, man's endeavours once again returned to the conquest of science and understanding rather than conquest of planetary bodies. With the launching of the Soyuz and Skylab Space stations in 1971 and 1973 respectively the advantage of cooperation became obvious and the first moves towards developing an International Space Station were taken when an Apollo Module docked with a Soyuz capsule in 1975. The Space Race was over. A new age beckoned.

As the catalogue of space missions above confirms the competition for space superiority between the U.S.A and the U.S.S.R was fierce. The urgency of the chase drove science and technology to new heights and those gains changed the world. NASA, for example, has recognised over 2000 commercial spin-off products from its space programme in a wide range of areas:-

Artificial limbs – innovations designed for space vehicles including artificial muscle systems, robotic sensors, diamond joint coatings, and temper foam, used to enhance artificial limbs.

Scratch resistant lenses

Insulin Pump- needed to monitor astronauts vital signs adapted to regulate blood sugar levels.

Fire-fighting equipment – polymers used for space suits for heat resistance and flame retardants and breathing apparatus adapted for use by firemen and home insulation.

Battery powered tools for drilling rock samples led to compact, cordless vacuum cleaners.

Shock Absorbers for building developed from the protection of equipment during launches.

Solar Cells_

Water Filtration – designed to protect astronauts now the basis of modern filtrations systems.

Better Tyres using materials developed for Viking Lander parachute shrouds.

Wireless Headsets

Adjustable smoke detectors

Freeze-dried foods

Camera Phones from NASA technology for moon images.

Air Purifiers

Memory Foam originally invented as a pad for astronaut seats

Work-out machines

Infra-red ear thermometers

Computer Mouse

Athletic Shoes using materials designed for astronaut's helmets

CAT scans – digital signal technology designed to create imagers of the moon is the basis for CAT scans and MRI technology.

Many of these devices emerged from the development of solid-state electronics during the 1960's. This was based upon the discovery of the transistor in 1947. With the ability to amplify current or turn it off, it replaced the bulky, fragile and energy hungry vacuum tubes of the early computers to become the active component of solid integrated circuits. This was in turn revolutionised by the development of the MOS Integrated Circuit Chip in 1959 enabling the large-scale integration of hundreds of transistors in a single chip. THE MOS Transistor revolutionised the electronics industry. It rapidly developed into the Silicon Chip capable of containing billions of these miniscule devices etched into its shiny surface. It enabled the development of the first truly portable electronics such as transistor radios, cassette tape players, walkie-talkies, quartz watches as well as the first practical computers, mobile phones, Video Games, hand-held pocket calculators, digital cameras, Video Recorders and domestic Microwaves, all of which appeared on the scene before 1980. It became the nerve cells of the Information Age. Perhaps more significantly, however, it created an optimism that technology genuinely could solve nearly every problem that confronted mankind. There ensued a surge of investment in research and development to chase the pots of gold awaiting the innovations that were guaranteed to emerge. There would be no disappointment. The new emerging technologies opened the door to the 3rd Industrial Revolution.

As usual, the competition to produce the fastest, largest, cheapest, reliable and most novel was particularly noticeable in the transport industries as the most iconic examples of the era will now show.

The change in aerospace engineering during the 1960's almost matched the space programme for its pace and ambition. Huge progress was made of three fronts – speed, range and capacity. By the end of the 1950's the development of jet airliners had advanced from the prototype 'Comets' to a generation of aircraft spearheaded by the Boeing 707 – a long-

range, narrow bodied plane which became the most common passenger aircraft of the 1960's.

Passenger Capacity : 189

Range: 6616 miles

Cruise Speed: 621 mph

Aircraft with similar specifications included the Vickers Super VC10 (1962) powered by 4 rear-mounted jets for reduced cabin noise, and the Hawker Siddeley Trident 1 with a different configuration of 3 rear-mounted jets but equipped with the first fully automatic blind landing system.

By 1969, however, all were thoroughly eclipsed by the two most iconic aircraft of the age:

Concorde

Engines: Rolls-Royce /Snecma Olympus 593

Cruise Speed : 1359 mph at 60,000 ft. Range: 4143 miles Passenger Capacity 100

Fuel consumption: 5638 gallons per hour

Boeing 747

Engines: JT9D Turbofan

Cruise Speed: 565 mph

Range: 8995 miles

Passenger Capacity: 366

The development of the passenger airliner ushered in a new age of travel. Air travel became the popular choice as accessibility and affordability opened the door of opportunity to the working class. It became the springboard for the package holiday offering sun, sea and sand on Mediterranean beaches cheaper and less distant in time than many resorts in the UK. New opportunities for long-haul flights, plus images of the earth from space, changed perceptions of the planet. It suddenly became a much smaller place. Journeys to the Antipodes and to the farther reaches of the Continents, once several week's sea journey away could now be achieved in hours. The consequences were profound. Air mail and air freight services escalated. Trade increased. The impact even reached the dinner plates of the British public as fresh fruit and vegetables from warmer climes became available during winter!

The discovery and development of nuclear weapons during the 1950's and the idea of mutual annihilation at the press of a button brought an end to the prospects of all-out war, even though the Cuban crisis of 1962 brought it perilously close. Emphasis shifted to defence and the rapid suppression and containment of conflict at the more localised level before it could get out of hand. The focus of aircraft development moved towards strike speed, missile accuracy, electronic warfare and reconnaissance. Two iconic aircraft represent the advance made, again the product of the 1960's.

McDonnell Douglas F4 Phantom (1961)

A two-seat, twin engine, all weather, long range supersonic jet interceptor and fighter bomber. A legendary aircraft developed in the U.S.A. and bought by Air Forces around the world, including the RAF. It established 16 speed, altitude and time-to-climb records.

Top Speed : 1472 mph (Mach 2); Range: 1677 miles; Height: 60,000 feet.

Weaponry: Air to Air, Air to Ground missiles, cannon and bombs. Operable from Air Craft Carriers.

Hawker Harrier Jump Jet

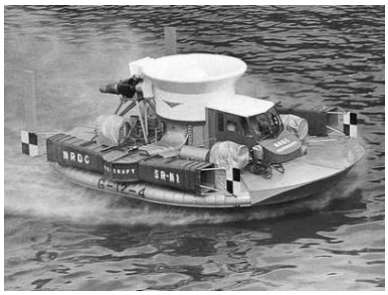
A vertical take-off aircraft designed to fly from improvised bases like car parks or forest clearings it was developed as a sub-sonic close support and reconnaissance attack aircraft widely used from Air Craft Carriers and sold to Navies and Air Forces around the world. More capable versions were developed in the 70's and 80's.

Top Speed: 545 mph Combat Radius: 230 miles.

The same cold-war pressures to maintain a balance of power also drove innovation in the Navy. When it became clear that refined radar technology and accurate surface-to-air missiles would halt the delivery of nuclear bombs by air, attention turned to the development of

submarines to achieve manoeuvrability and stealth. Thus was born the Nuclear Submarine with the ability to stay hidden at sea almost indefinitely, or at least as long as the food supply world allow. The first to go into service was the USS George Washington in November 1960. British efforts were developed under the Polaris Programme and four Resolution Class nuclear submarines each armed with 16 Polaris A3 nuclear missiles went into service in 1968.

In the commercial world there were other notable developments that also changed the world. One novel, and perhaps unexpected development was the Hovercraft first conceived by Christopher Cockerell and demonstrated in June 1959. Its potential was confirmed by a channel crossing one month later in July and the concept was developed at lightning speed. Small scale ferry services were introduced as early as 1962 and by 1968 huge craft were in commercial operation from Dover / Ramsgate to Calais under the auspices of Hoverspeed and Hoverlloyd. The SRN4 Class was developed to carry 418 passengers and 60 cars. With a maximum speed of 95mph and a cruising speed of 68mph it was capable of crossing the channel in as little as 22 minutes. It remained in operation for upwards of 30 years. Its usefulness for rapid transit in coastal areas and in many inhospitable terrains especially marshland, everglades and deserts for military, life-saving and other purposes was also rapidly exploited.



In all of these developments it is the speed of advance which gives some credence to the idea of the 'swinging sixties'. At its root is the growing efficiency of global communications via Radio, Television, telephone and teletext – all now becoming instantaneous through satellites. New ideas for development could now be shared amongst a growing global community. More minds were brought to bear on the issues in a growing number of research establishments and University Laboratories throughout the free world. The hitherto secret world of scientific development opened up. Nowhere is this more true than in Medicine where political and strategic issues are subjugated to the greater good of humanity itself. The advances here, every bit as amazing as the above, were pioneered in hospital theatres and Labs in many different countries across the world. Some of the medical innovations can be listed as:-

1960's Liver, Lung and Heart transplants, Coronary artery by-pass surgery, Breast implants, Soft contact lenses, Oral birth control pills, Valium, home kidney dialysis machines, Mammograms for Brest Cancer, Cryosurgery, Anti-body resistance, limb Reattachments.

Not all change resulted from pressing the boundaries of Science. New technologies also forced existing one into obsolescence. This was most noticeably the case during the early years of the 20th Century when steam power, the driving force of the Industrial Revolution, was usurped by electricity. However, it was not until 1968 that the revolution caught up with the railway transport system when finally steam engines were consigned to the breakers yard. From 1960 well over 2,500 steam engines were replaced with electric or diesel-electric locomotives offering more convenience, versatility and speed.

There were, however, other pressures on the railways. Car ownership rocketed during the 60's from 5 million in 1960 to 13.5 million in 1970; from 31% of households to 52%. By 1970 ¾ of passenger miles were by private car and the transport of freight by rail had collapsed. The railway was derided as cumbersome and outdated and there were panicked attempts at modernisation during the late 50's which failed to halt the decline. By 1961 it was estimated that British Railways was losing £300,000 per day! Radical measures were called for by the Beeching Report of 1963 which led rapidly to the closure of 2,363 stations and over 5000 miles of track. Uneconomic branch-lines were axed and the land sold off. The great institution that was the Railways, so central to the Industrial revolution and so life changing for the populace, finally conceded defeat to road transport and retreated to the periphery of British life.

The surge of traffic on a road network already under extreme pressure by the end of the 50's heralded a revolutionary modernisation of the major routes. Motorway construction was rapid during the 60's allowing rapid transit between cities. The problem of the cities themselves was another matter. The funnelling of traffic from motorway to city street created a major headache. Buchanan's 'Traffic in Towns' Report of 1963 predicted "a desperate emergency. Unless steps are taken, the motor vehicle will defeat its own utility and bring about a disastrous degradation of the surroundings for living". He commented that, even then, the "average speed in many cities had fallen to 11 mph and congestion was costing the British economy £250 million in wasted man-hours." Predicting that car ownership would rise from 10 million to about 40 million by 1980 he foresaw a nightmare. There were to be no easy solutions. There was a rash of by-pass construction, ring-roads and one-way traffic management systems, car parks and, where conditions allowed continued high-rise developments creating space for roadways together with a plethora of punitive parking measures. Parking Meters, Double yellow lines, ticketing and fines all date to this era – anything to deter people from bringing vehicles into towns. The difficulties stimulated catalogue shopping and the development of out-of-town Hypermarkets and Trading Estates.

Obtusely, vehicles themselves were adapted to higher speeds. Motorways ushered in a new era of fast, powerful cars like the Jaguar Mk 11 and the GT, a new type of fast touring car. The trend also provoked a reaction. Speed restrictions of 70mph were introduced along with other measures to enhance safety like seatbelts and breathalyser testing, both introduced in 1967. Beyond this car design changed little with only minor changes of fashion and small tweaks to body shape. The exception was the introduction of the 'hatch-back' which gained in popularity during the period. Otherwise innovation and refinement occurred beneath the bonnet, on the instrument panel and with the extension of front-wheeled drive. There was also a noticeable difference on the forecourt as the first self-service petrol stations appeared on the scene in 1961. The most popular selling car of each decade were:-

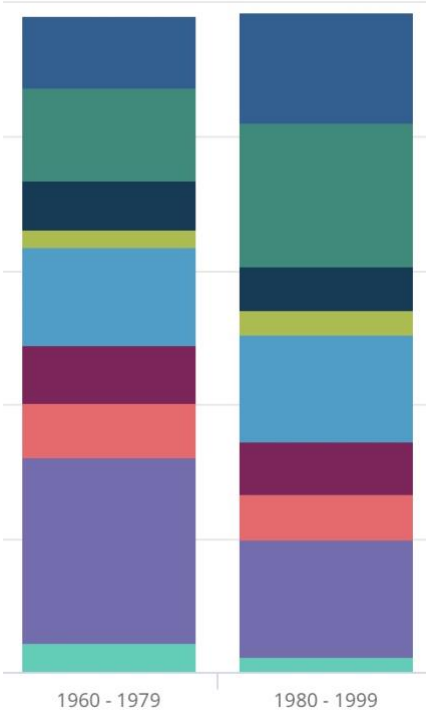
1965 Austin / Morris 1100

1975 Ford Cortina

Car production reached a peak in 1963. 1 million people were employed by BMC (Austin / Morris); Rootes (Hillman, singer, Sunbeam, Humber); Ford and General Motors (Vauxhall). Together they manufactured 1,867,640 new cars satisfying 95% of the British market. Foreign imports were only 5%. By 1970, however, the situation was very different. The UK industry was losing competitiveness on price and quality. Government attempts at rescue, including the nationalisation of British Leyland, failed and the emergence of the far eastern car manufacturing industry changed the landscape completely.

Changes in economic and political circumstances can also promote dramatic change. The car industry was not the only one to suffer from stifling competition from abroad and the gradual loss of export markets. As the graphs (over) illustrate from 1960 onwards there was a sharp decline in the traditional heavy industries – Coal Mining, Iron and Steel and Heavy Engineering – key, bedrock industries upon which large communities depended. As job losses accelerated Union militancy rose to battle readiness. Persistent and damaging strikes added further nails to the coffin. Nowhere was this more true than in Coalmining. The industry had been in decline for years. The best coal seams had long since been worked out, costs of extraction were rising and demand was falling. Inflation and the wage rises that came in its wake finally broke the camel's back. Pit closures became inevitable. In 1960 there were 483 pits producing 177 million tonnes of coal and employing 500,000 miners. By 1979 working

pits had been reduced to 240 producing 114 million tonnes and employing 300,000 miners. Needless to say the journey into decline was not smooth! The public mood was also changing.



The Aberfan Disaster of 1966 where pit spoil, destabilised by heavy rain, slithered down a mountainside, engulfed a school and killed 116 children and 28 adults brought into focus the environmental damage of coal extraction. The curbs on smoke emissions and danger to public health also hastened the call for alternative energy sources.

Oil and Natural Gas became the obvious successor to coal but it too was burdened by economic constraint. With the growth of road transport, the emergence of oil-fired Power Stations, and the proliferation of Petro-chemical products, imports had steadily increased just as the country's exports were diminishing fast. During the 60's, therefore, to avoid serious balance of payments problems, it became prudent to hold on to home- produced coal. All changed, however, with the discovery of North Sea Oil and Natural Gas. Oil became our saviour as the world economy teetered.

The emergence of the oil industry was not without its environmental restraints. Six huge refineries were built on deep water estuaries around the British Isles. Some were the size of small towns developing rapidly to accommodate larger and larger deliveries of crude oil from new and expanding Super-tankers. At the time of the Suez Crisis in 1956 the largest vessel carried 47,500 DWT's. The brief closure of the Canal diverted traffic around the Cape of Good Hope – a long journey made economic by increasing the capacity of Oil Tankers. Consequently, the tonnage of the largest vessels increased from 104,000 DWT's in 1958 to 564,760 DWT's in 1979. The risks of transporting such quantities was made clear in March 1967 when the Torrey Canyon Super-tanker ran aground off Land's End, broke its back, and disgorged thousands of tons of crude oil into the sea. Efforts at containment and retrieval were only partially successful with the result that large stretches of coast were badly contaminated with heavy oil sludge which proved difficult and costly to remove. The ecological consequences on wildlife and habitat were also alarming.

Disasters often shape the course of history. So it proved at Ronan Point, a 22 storey high-rise apartment building in Newham, East London. In May 1968 a small gas explosion on the 18th floor caused the collapse of the entire corner of the building with the loss of 4 lives and the injuries of 17 other people. Following a Public Enquiry Ronan Point, plus 9 other adjacent tower-blocks, were eventually demolished along with many others around the country. Public confidence was shaken. Dissatisfaction with high-rise living had been growing. The ideals of the town planners for community cohesion were not realised. Youth in particular rebelled against the boxed restrictions and vandalism and environmental abuse grew. The inadequacies for family living became more obvious and high rise developments were curtailed.

House building, by contrast, was in full swing, still trying to play catch-up from the war and chasing an ever rising population. From 1960 to 1970 the population rose from 52 million to 55 million. – an unprecedented increase. Hence building reached a peak in 1968 when 350,000 were built during the year though the average for the period was closer to 250,000, 40% of which were Council houses. Per force the majority were now being built on green-field sites as estates. Towns and cities expanded over the countryside swallowing village settlements and, in places, merging with neighbouring towns. Urban 'sprawl', 'Green Belt' and environmental protection swept up the agenda as concerns grew for the future.

Elsewhere in the countryside the pace of environmental change was between slow and full-stop. The extensivisation of arable farming continued with the uprooting of hedgerows to give passage to machines of ever growing size and ability, accompanied by the intensification of cropping with the introduction of new strains and a growing bank of chemicals to fertilise and protect the growing plants. Crop yields grew massively. Farm sizes also grew and grew. There was a 65% decline in the number of farm units, and a 77% decline in farm labour. For the consumer, however, the most notable change was in poultry production where new large-scale battery methods took chicken from an expensive rarity to a cheap favourite.

In the realms of Science and Technology there is no doubt that the 1960's was a decade of remarkable achievement and advance. There was a noticeable trend towards the manufacture of high-value products – Reactors, electronics, pharmaceuticals, military equipment, car parts, gas turbines, computers and whisky. The traditional manufacturing industries declined and the service sector grew. Financial Services (Insurance and Banking) and TV and Education all flourished. It was a decade of optimism, full employment and growing personal wealth but socio-economic change was on its way as we shall now see.