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Headings	Notes
THE ARMS RACE AND THE COLD WAR	• During the Second World War the United States spent vast sums of money on developing new weapons. Their main achievement was the **atom bomb**, which they used against Japan in 1945. • During the Cold War, the two superpowers also competed to produce more deadly weapons and the means to deliver them. This is called the **arms race**. • This arms race also led to the invention and development of new technologies, such as computers and the internet, which were of value to civilian society.
THE MILITARY-INDUSTRIAL COMPLEX	• The arms race poured huge sums of money into large American firms like Boeing and IBM to develop new weapons systems. • This link between the army and business is often called the **Military-Industrial Complex**. Some American political leaders fear that it had a bad effect on American democracy.
DEVELOPING BIGGER BOMBS	• In 1949, the Soviet Union exploded its own atom bomb. This encouraged the US to produce a **hydrogen bomb** in 1952. It was over 1,000 times more powerful than the first A-bomb. • In the early 1960s, a **neutron bomb** was developed. It was designed to kill people, while leaving the buildings standing. • Tests of these bombs were carried on in the open, leading to contamination by radiation. This ended with the **Test Ban Treaty** in 1963.
DEVELOPING DELIVERY SYSTEMS	• **Planes**: After the Second World War the **jet engine** appeared. The US first used jet planes in Korea. Supersonic planes appeared in the 1950s. In the 1980s, **stealth** technology produced planes which could avoid detection by enemy radar. • The US also produced huge **aircraft carriers**, nuclear powered from the 1980s, which could carry American air-power to any part of the world. • **Missiles**: The **Minuteman**, developed in 1962, could be fired at short notice from underground bunkers and carry nuclear war-heads into the Soviet Union. Later, missiles like the **Peacekeeper**, were developed – it had the ability to break into several war-heads, each carrying a bomb to a separate target.
Keywords	**Summary**

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DEVELOPING DELIVERY SYSTEMS	• **Nuclear-powered submarines** were developed in the 1960s. Able to cruise for long periods under the sea, they were armed with **Polaris**, and later **Trident**, missiles carrying nuclear bombs. Americans believed that the Soviets would be **deterred** from attacking by the knowledge that the submarines could retaliate, even if the US was destroyed.
SPYING ON THE ENEMY	• The US wanted to watch what the Soviet Union was doing. At first, they used high-flying planes like the U-2 which could fly at 70,000 feet. • Later, they developed spy-satellites which orbited the earth, taking photographs and listening in on radio communications. These then developed into **Global Positioning Systems** (**GPS**), which allowed soldiers to identify targets on the battlefield.
THE THEORY OF DETERRENCE	• By the 1970s, each side had enough weapons to destroy the other (and the earth) many times over. • Some historians think that may have **deterred** (stopped) the superpowers from going to war because they feared '**mutually assured destruction**' (**MAD**) (i.e. everyone would be destroyed).
DEVELOPMENTS IN INFORMATION TECHNOLOGY ***EARLY COMPUTERS***	• Weapons systems and space exploration depended on **powerful computers**. • The first computers were built in England to help break secret German codes. The American military took them over and produced the first general computer in 1946. Weighing 19 tonnes, it was used in nuclear research. • The first commercial computer, the **Universal Automatic Computer** (**UNIVAC**) appeared in 1951. Using punch cards to input information, it cost over $1 million, occupied a lot of space and its memory could only hold 1,000 words. • The invention of the **transistor** changed computing. Computers from the 1960s, most of them by IBM, were cheaper and easier to program, but they still occupied a separate room. Most were used by banks and universities.

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PERSONAL COMPUTERS	• To do more complex calculations several transistors were combined on a piece of silicon. These **integrated circuits** or **microchips** allowed computers to become smaller and faster.
	• In the 1970s, the development of the **micro-processor** led to the personal computer with a small screen. Operators no longer needed cards but could type information in directly.
	• **Apple** developed the first personal computer in 1976. They were affordable and easy to use. The **Apple Macintosh** (1984) was the first to use a mouse and a drop-down menu.
	• Through the 1980s, computers got smaller, more powerful and cheaper. The number of home computers rocketed. The **Microsoft** company came to dominate the market.
	• The spread of personal computers led to computer games, such as **Nintendo** and **Game Boy**.
THE INTERNET	• The US military worried about what would happen if a Soviet bomb blew up their central control.
	• To avoid that they created a network of computers (**ARPANET**) loosely linked together (i.e. sharing information), which could survive an attack. This formed the basis of the modern **internet**.
	• At first, this just linked universities, but around 1990 it took off with ordinary people buying computers and linking up.
	• Developments in **fibre optics** in the 1990s allowed vast quantities of information to be carried along a phone line to a computer with a modem.
CASE STUDY: THE SPACE RACE AND THE MOON LANDING	• The most spectacular aspect of the arms race was the moon landing. It grew out of the competition between the superpowers to develop bigger and better rockets to carry their weapons into the enemy's territory.
1945–1961: COMPETING ROCKET TECHNOLOGIES	• During the Second World War, the Nazis developed the **V1** and **V2** rockets. In 1945, the Soviets and Americans competed to capture German rocket scientists. The US got **Wernher von Braun**, head of the German research team.
	• The US did little about rocket technology until the Russians launched the first **Inter- Continental**
	• **Ballistic Missile** (**ICBM**), and the first man-made earth satellite, **sputnik**, in 1957.
	• This created panic in America: could the Soviets launch a rocket attack from space? Was there a '*missile gap*'? Spending on missile technology grew rapidly.

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1945–1961: COMPETING ROCKET TECHNOLOGIES	• Late in 1957, the Americans launched their first ICBM, the **Atlas rocket**. In 1958, they sent up their first earth satellite and Eisenhower established the **National Aeronautics and Space Administration** (**NASA**) to encourage space exploration.
	• But the Soviets were still ahead. In 1960, their **Luna II** rocket hit the moon and in 1961 their astronaut **Yuri Gagarin** became the first man in space.
	• These developments spurred President Kennedy to promise in 1961 that the US would put a man on the moon by the end of the 1960s.
THE FIRST STEPS	• To land men on the moon, NASA first had to find out if they could survive in space and be safely returned to earth.
	• The **Mercury Programme** (1959–1963) flew six manned test flights. As part of the programme, **John Glen** became the first American to orbit the earth in 1962.
	• In the **Gemini Project** (1963–1966), ten space flights tested and improved ways of controlling craft in space and linking one space craft to another (**docking**).
	• The 1965, **Gemini 4** saw the first American 'space walk' when an astronaut left the craft and returned safely.
	• In 1967, **Gemini 7** spent two weeks in space showing that men could survive a long period of weightlessness and **Gemini 8** successfully docked two space craft.
THE APOLLO PROGRAMME (1961–1972)	• The **Apollo Programme** was to carry out the moon landing.
	• It used the **Saturn V**, the most powerful rocket ever built. It was designed by Wernher von Braun. Holding one million gallons of fuel, it was divided into three stages. After blast off, stages dropped away one by one to save weight.
	• The Saturn rocket carried:
	• A **Command Module** (**Columbia**), where the astronauts lived. Designed to orbit the moon and return to earth, it was enclosed in special tiles which could withstand high temperatures on re-entry to the earth's atmosphere.

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THE APOLLO PROGRAMME (1961–1972	• A **Lunar Module** (nicknamed the **Eagle**) which was to break away from the Command Module and land on the moon. It had two stages. The **lower** contained exploration equipment and rockets to slow down the descent onto the moon. It was to be left behind on the moon. The **upper** would carry the astronauts back to the Command Module.
	• To test each step, there were ten Apollo missions before the moon landing. NASA used the lessons learned from each mission to improve the design of its rockets and modules.
	• In December 1968, **Apollo 8** carried three men into orbit around the moon and returned them safely to earth.
	• In 1969, **Apollo 10** took another three to within nine miles of the moon's surface and returned safely.
	• By July 1969, everything was in place for the final attempt.
16–19 JULY: THE JOURNEY TO THE MOON	• At 9.32am on 16 July, **Apollo 11** lifted off from the Kennedy Space Centre in Florida. It carried three men, **Neil Armstrong**, **Buzz Aldrin** and **Michael Collins** – who had been chosen from 20 trained astronauts, to go to the moon.
	• After orbiting the earth, thruster rockets sent the Command Module, **Columbia**, towards the moon at 25,000 mph.
	• The journey took three days. Conditions in Columbia were cramped. The men had to adapt to weightlessness. They had to squeeze food into their mouths and tie themselves into their bunks to sleep.
	• On 19 July, Columbia went into orbit 69 miles above the surface of the moon. It circled the moon every two hours.
20 JULY: LANDING ON THE MOON	• Collins remained in Columbia, while Armstrong and Aldrin transferred to the Lunar Module.
	• It separated from Columbia and headed for the moon's surface, at all times being under the control of computers at Mission Control in Florida.
	• As they approached the surface, they saw the chosen landing site was covered with rocks. Armstrong took the controls and guided the Module to a flat area in the **Sea of Tranquillity**.

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20 JULY: LANDING ON THE MOON	• Cheering broke out in Mission Control when they heard him report: '*The Eagle has landed*'.
	• The astronauts checked the equipment and then put on their space suits. Armstrong went first, setting off a TV camera to record the moment. He said: '*That's one small step for man – one giant leap for mankind*'.
	• The moment was watched by an estimated 600 million people back on earth.
	• The two men planted the American flag, collected about 60 pounds of moon rock, took many pictures and set up a number of scientific experiments.
THE JOURNEY HOME	• After that, Armstrong and Aldrin returned to the Lunar Module. They left unnecessary equipment behind and blasted off for the waiting Columbia. After docking with it, they abandoned the Lunar Module too.
	• Columbia reached earth again on 24 July. Parachutes slowed its descent into the Pacific.
	• Navy divers helped the astronauts out and they transferred to an aircraft carrier where President Nixon greeted them.
	• The return was watched by millions of television viewers around the world. But reports of this American success were not broadcast in the USSR or China.
LATER APOLLO FLIGHTS AND THE END OF THE SPACE RACE	• There were five more moon landings between 1969 and 1972.
	• **Apollo 13** almost turned into a disaster when an oxygen tank exploded. As the world watched with bated breath, the astronauts got home safely, crammed into the Lunar Module.
	• The 1972 Apollo mission was the last. Interest in manned space exploration had declined since the first moon landing.
	• It had cost $27 billion to put men on the moon and many Americans did not see why they should go on with this hugely expensive operation once they had achieved their aim.
	• The US economy declined in the 1970s, so less money was available and the détente with the Soviet Union reduced the need to compete with it.
	• The US turned to other, less expensive, forms of space exploration, sending unmanned probes to nearby planets, like Mars and Venus, to take photographs and make scientific observations.
	• It also tried with limited success to develop a reusable 'space shuttle'.

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WHY DID THE US WIN THE SPACE RACE?	• By putting men on the moon the US won the space race, but although this was a huge propaganda victory, it made little difference to the Cold War. • The Americans won because all Presidents after Kennedy were prepared to pour money into the project. • The Soviet Union was not willing to devote such large resources to getting to the moon and concentrated instead on developing a space station which orbited the earth.

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EXAM QUESTIONS	• How did the US achieve a successful moon landing in 1969, and what was its significance at home and abroad? (HL 2023) • During the period 1945-1989, what advances were made in military, space and information technology and how did they influence daily life in the United States? (HL 2022 DP) • How did the US achieve a successful moon landing in 1969 and what was its national and international significance for the US? (HL 2019) • During the period 1945-1989, what was the significance of advances made in space travel and information technology? (HL 2018) • What was the significance of the moon landing (1969) and/or Star Wars? (HL 2016) • During the period 1945-1989, what advances were made by the Americans in military, space and information technology? (HL 2015) • How did the Americans achieve a successful moon landing in 1969 and what was its importance for the US? (HL 2014) • What was the impact of the Moon Landing on US domestic and foreign affairs? (HL 2010) • What was the importance of one or more of the following: McCarthyism; the Moon Landing, 1969; developments in information technology? (HL 2006)

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Timeline of major events:

1. 1957, Sputnik I, first satellite in space, USSR
2. 1957, First creature in space (Laika the dog), USSR
3. 1958, Explorer I, first satellite launched by USA
4. 1958, NASA Established
5. 1960, Luna II, first probe lands on moon, USSR
6. 1961, Yuri Gagarin is first man in space, USSR
7. 1961, Alan Shepard is first American in space
8. 1961, JFK pledges USA will put first man on moon
9. 1962, Mercury 7, John Glenn is first American in orbit
10. 1965, Gemini 4, Edward White performs first American space-walk
11. 1967, Apollo I tragedy kills 3 Astronauts
12. 1967, Saturn V rocket successfully tested
13. 1968, Apollo 8 successfully orbits the moon
14. 1969, Apollo 11 lands 2 men on the moon

The Cold War

1. Intense rivalry in the political arena
2. Leads to a desperate race between the two superpowers - the “space race”
3. A contest for prestige and propaganda potential
4. Chance to prove superiority of political and economic system
5. Rocket development had military implications for the “arms race”
6. After WWII both USA and USSR worked to build ICBMS (Inter-Continental Ballistic Missiles) that could travel thousands of miles to deliver nuclear warheads
7. These rockets could also send satellites and men into orbit

The Space Race – Part One

1. After WW2 the Americans believed they had the edge
2. German scientists like Werner von Braun had developed the VI and V2 rockets for the Nazis - now worked for the US military3. US & USSR “grab” what they can of the German rocket programme
4. Both launched rocket programmes of their own
5. USA had bases in Europe near the USSR and could launch a nuclear strike6. USSR needed longer-range rockets
7. Spies active on both sides
8. 1960 – U2 Pilot Francis Powers shot down by Soviets and held for 2 years9. Surveillance satellites that could take photos from space are thus another incentive
10. The reaction to Sputnik was shock that the USSR had beaten the USA – a big propaganda impact
11. USSR had developed missiles that could reach USA
12. Eisenhower secretly happy – can press ahead with his plans for spy satellites

The Space Race – Part Two

1. LB Johnson created a huge fuss over Sputnik which forced Eisenhower into the space race
2. Media - “free world must control space”
3. ‘Outer Space Treaty’ of 1967 said neither side could claim the moon4. After election (1961) JF Kennedy promises: USA would have man on the moon “before the decade is out”
5. Gemini Project – 2-man flights, test docking techniques, space-walks
6. Apollo Programme – test soft landings on the moon, photograph the surface, lunar Orbiter – photographed possible landing sites
7. American technology overtakes the Russians
8. LBJ becomes President in 1963: “*I do not believe this generation of Americans is willing to resign itself to going to bed each night by the light of a communist moon*”.

Results1. Fulfilled J.F. Kennedy’s commitment
2. Huge project involving over 400,000 people3. USA now leads the “space race” – victory for the West
4. USSR had launched Luna XV to try to deflect attention from Apollo 11 but it crash-landed on the moon
5. USSR concentrated on space stations – led the way but not as valuable for propaganda
6. Budget cuts in the late 1960s and 1970s meant nobody has landed on the moon since 1972

Why was the USA the first country to put a man on the moon?1. The USSR did not put as much funding into its lunar programme as the US did
2. The US wanted a dramatic success in Space Programme3. Despite urban poverty and criticisms from some Americans, massive spending continued on the programme
4. The US had made big advances in science and technology
5. The US wanted to take the dominant role in world affairs
6. The USA felt threatened by Soviet advances in the Space Race