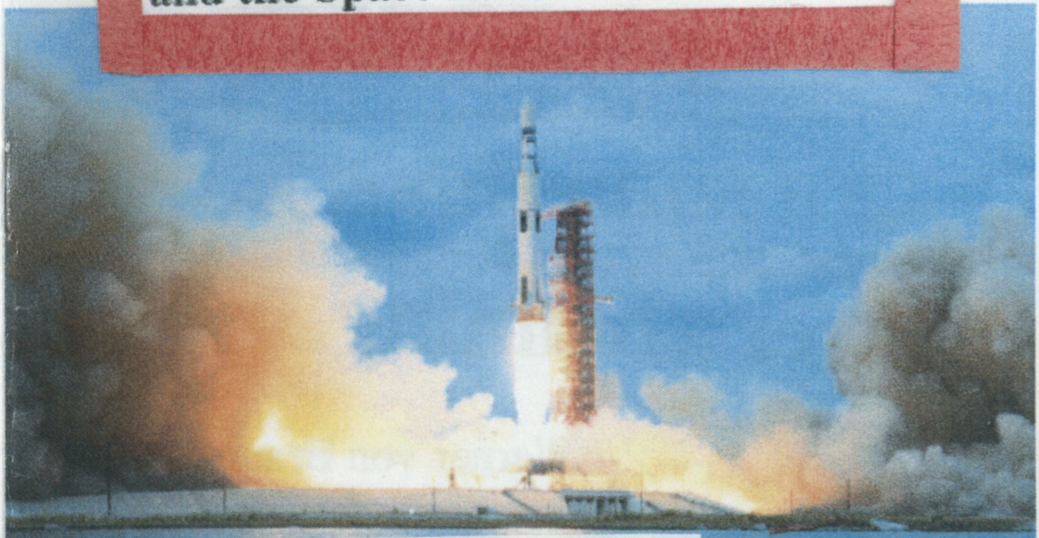
"To Use the Word Impossible With the Greatest Caution"

The Story of Wernher von Braun and the Space Race



By Dashwood Davis

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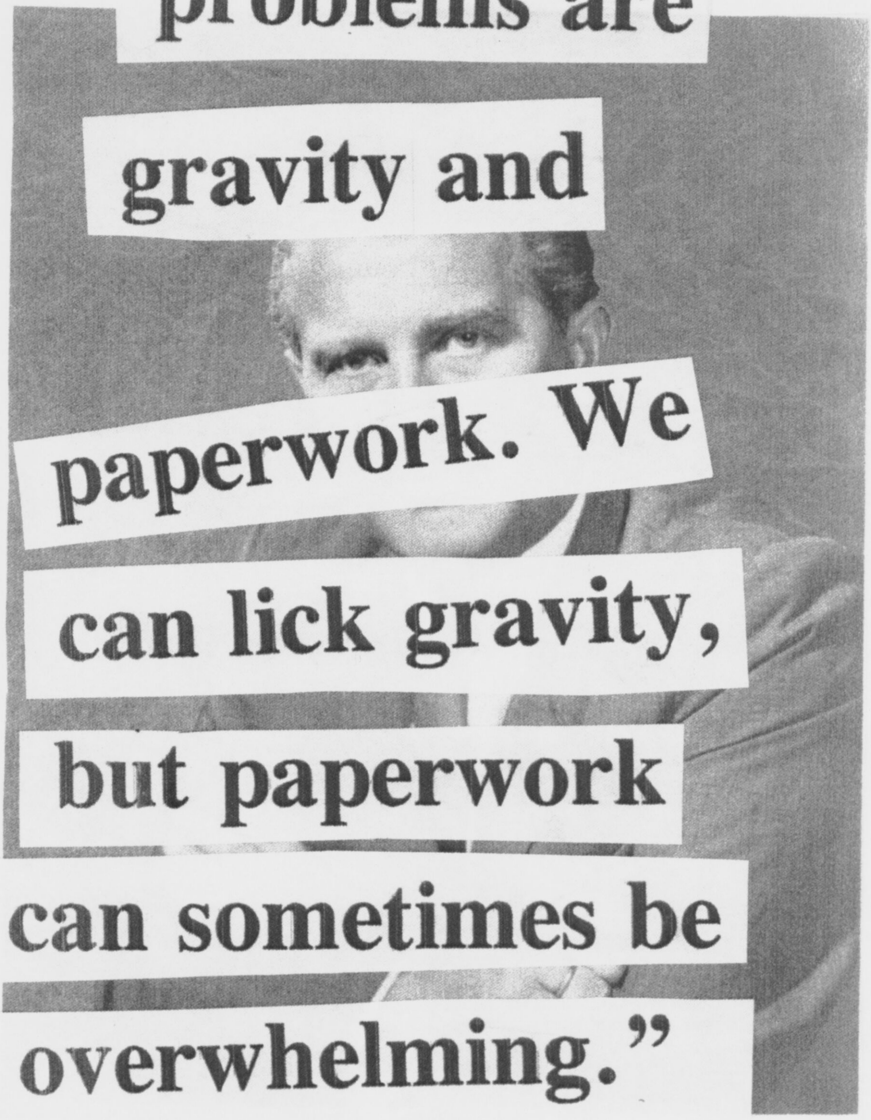

– Werner von Braun

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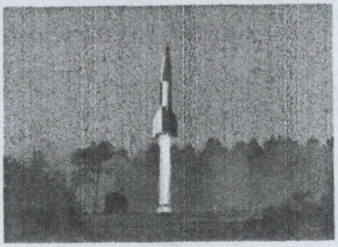
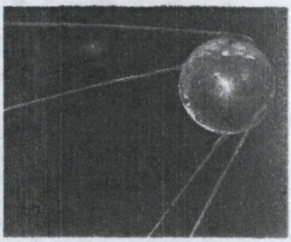
Timeline

First Launch of the V-2



On 3 October 1942 the first V-2 was launched after the previous two which failed.

The First Man-Made Satellite



The Soviet sent the first man-made satellite into space on 4 October 1957.

1940 — 1950

Wernher von Braun came to America

Wernher von Braun came to America in 1945 after the Germans had surrendered to the Allies.

The First American Satellite

On 31 January 1958, the Explorer 1 became the first American satellite to go to space.

The First Person in Space

On 12 April 1961 the Soviets sent Major Yuri Gagarin to space.

Kennedy's Moon Speech

On 12 September 1962, President J. F. Kennedy gave a speech committing that America would go the the moon before the end of the decade

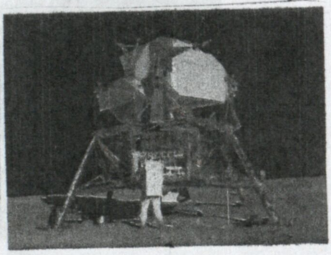
1960

1970

First American in Space

On 5 May 1961, the Americans launched Alan Shepard into space.

First Lunar Landing



On 16 July 1969 Apollo 11 was launched and on 20 July they landed on the lunar surface.

Introduction

You may have heard of the Space Race or Neil Armstrong, but chances are you haven't heard of Wernher von Braun. Von Braun was a German and a Nazi during World War II and later came to America and helped them win the Space Race, a race to conquer space. But what was he really? Was he a Nazi? Or was he just taking advantage of the Nazi's money? That is what we will try and find out. We may never know what von Braun thought, but we know that he was a key figure in the Space Race.

Wernher von Braun

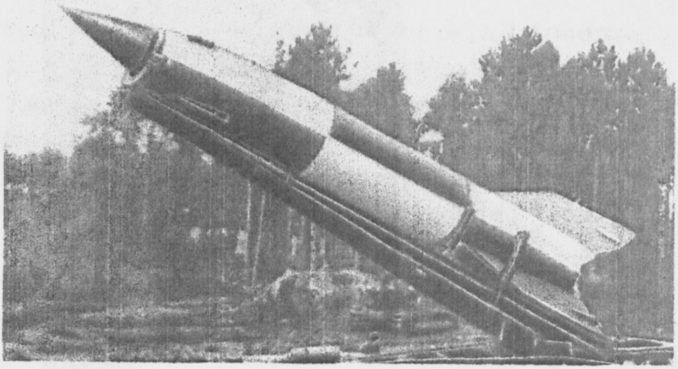
Wernher von Braun

Wernher Magnus Maximilian Freiherr von Braun was born into German nobility in 1912, hence the *von* in his name. His father was the Minister of Agriculture during the Weimar Republic in the 1920s. His mother could trace her heritage back to the Medieval kings of four different countries. As a child, von Braun's mother gave him a telescope for his birthday.

Von Braun shown in the far right with a team of scientists and engineers in the 1930's.

Von Braun entered college to pursue his dream of space flight and trips to the moon and other planets. He graduated from the Berlin Institute of Technology with a degree in mechanical engineering. He started post-graduate work in physics but in the summer of 1932, just months before the Nazis came to power, von Braun stopped his post-grad work and decided to help the military make weapons not banned by the 1919 Treaty of Versailles. During his work with the military, von Braun worked with a team in an artillery range in a pine forest near Kummersdarf, 60 miles south of Berlin.

By the end of 1934, von Braun was awarded a doctorate in physics in aerospace engineering. Three years later, in 1937 he was made technical director of the army's



The V-2 rocket Designed by Wernher von Braun and his German rocket team.

long-range ballistic missile program after it had been moved to Peenemäde, an island off the coast of northern Germany.

Von Braun joined the SS (the elite paramilitary organization in charge of reinforcing Nazi retail politics) so as not to ruin his reputation.

In 1942 von Braun's team created the first long-range ballistic missile, the 46ft long, black-and-white missile called the A-4, later renamed the V-2 (the *v* stood for vengeance). The V-2 had failed its first two launch attempts and if the third failed as well, von Braun and his team would be sent to the Soviet front, a virtual death sentence. On 3 October 1942, von Braun's team wept and danced with joy as the V-2 blasted with a deafening roar past the stratosphere and into the mesosphere. The third launch had been a success.

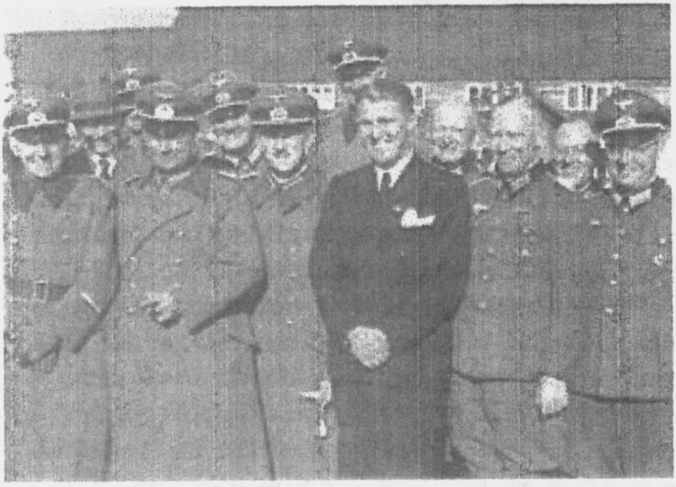
By the end of the war, the V-2 could carry up to 2200 pounds of explosives for 200 miles and to generally the right place. If it did not explode at lift-off, it could reach the

speed of 3500 miles per hour making it practically impossible to shoot down.

As 1943 came around, the war was not looking good for Germany so Hitler put top priority on the rocket program. By September of 1944, V-2s were raining down on targets in England, France, and Belgium, and by the end of the war, V-2s had killed 2754 British civilians and injured 6523 more. Though the V-2 was very destructive it was not the "miracle weapon" that Hitler had been hoping for.

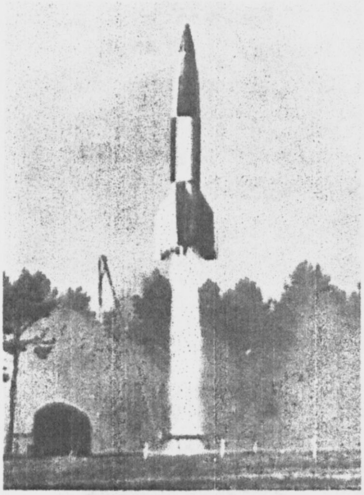
In August 1943, the British Royal Airforce bombed Peenemäde and killed almost 500 civilians and workers including two of von Braun's top scientists. Most of the people killed were Soviet and Polish workers, captured during the war.

After the Brits bombed Peenemäde, work on the V-2s was moved to Mittelwerk in an old mine shaft, 600



Von Braun shown with military officials.

miles west of the Harz Mountains, and 10,000 slave laborers worked to dig one mile into the hillside. These laborers worked very hard constructing the building where the V-2s were built as well as building the actual V-2s. By the end of the war, 20,000 people had been killed during the building of the V-2s, and the Nazi goal to build 900 V-2s per month was never accomplished.



V-2 at launch.

Though von Braun worked long hours, he still had time to party and hang out with girls. At one of these parties, an SS spy heard von Braun talking to some of his colleagues about his dream to go to space. She reported this to her boss and von Braun and some of his team were arrested. Their arrest didn't last long and as it was soon realized that von Braun was "indispensable" to the German war effort.

After his arrest von Braun started thinking about what to do after the war; it wasn't looking good for the Germans so who would he surrender to? Who would give the most hopeful outlook on future space flight: England, France, the USSR, or the United States? The first two didn't have enough money to support such an expensive project, it was down to the USA or the USSR. After conversing with

Von Braun in center.

some of the higher officers on his team he decided that they would go to America.

Von Braun and his team were told to destroy the plans for the V-2 rockets and things related to them, instead, he and his team hid the plans in an abandoned mine shaft.

When the Americans came to look for Germans who were part of the SS, Wernher von Braun's younger brother, Magnus von Braun got on his bike and pedaled down the hill with a white handkerchief tied on the handlebars. Magnus von Braun was chosen because he spoke passable English which he had learned from his nanny.

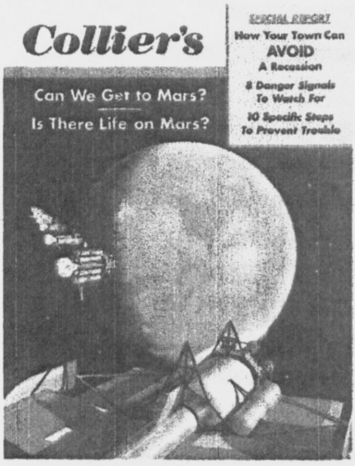
Magnus returned up the hill to fetch his brother and team after telling the Americans where the group of German

scientists were. On the journey to America Wernher von Braun was treated well.

The German scientists were meant to be taken to America for six months to help the US beat Japan, but this did not happen, they stayed for longer. On the 6th of August, 1945 the Americans dropped a nuclear bomb on Hiroshima and another on Nagasaki on the 9th of August, causing the Japanese to raise a white flag on the 15th.

In September of that same year, the scientists arrived at Fort Biss, just north of El Paso, Texas. The next year their families would join them in America, meanwhile, they had plenty of time to explore the world around them. Most found the place unattractive, but von Braun enjoyed it because it reminded him of the Old West he had read about in novels.

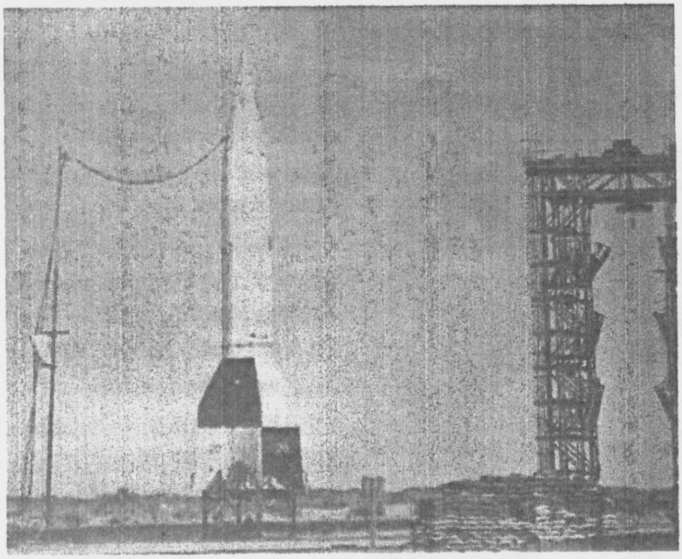
Over the next five years, von Braun and the team of German scientists worked on building and launching V-2s in White Sands Proving Grounds, New Mexico. In the late '40s, von Braun had quite a bit of time on his hands, so he wrote a number of pieces for *Collier's* magazine and he wrote an unpublished novel about a mission to Mars. The mission would include landing a series of gliders on the surface of Mars using its atmosphere, which at the time was



The *Collier's* Magazine.

thought to be much thicker and more like Earth's. The glider pilots would land on one of the poles of Mars and walk to the equator where they would set up a base and most of the rest of the crew would come down on more gliders and land on a runway created by the first group. While on Mars, they would carry out a series of tasks to explore the planet.

Von Braun was thinking not only about Mars but all of space flight and how to get it going. The USSR (the Soviet Union) was working on just that. They seemed to be working on sending a satellite into space and von Braun did not want them to beat the Americans into space.

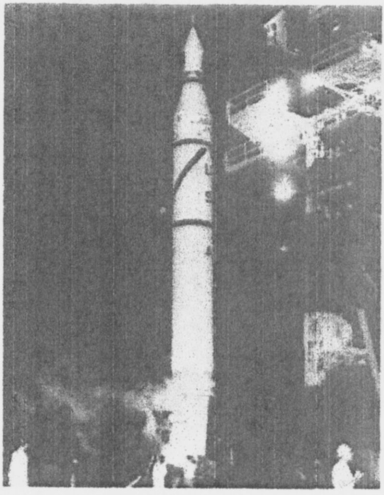


V-2 being tested at White Sands Proving ground.

The First Man-made Satellites

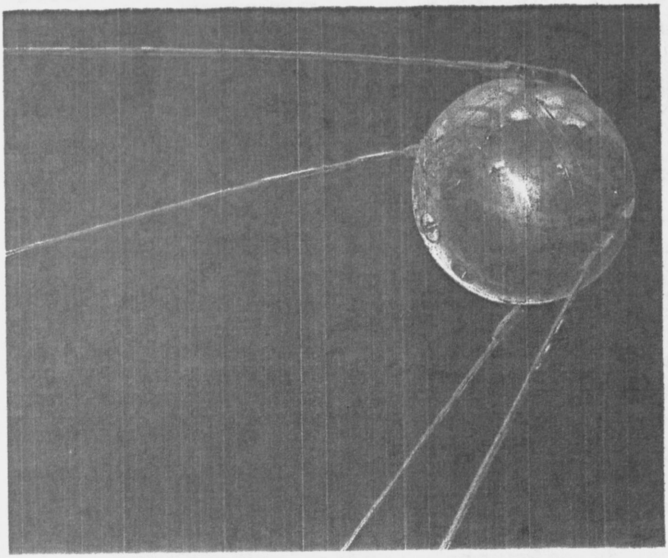
In the spring of 1950, with tensions between North and South Korea rising, von Braun and his team were moved from White Sands Proving Grounds, where they had been building and testing V-2s, to larger facilities in Huntsville, Alabama. Two former chemical weapons factories and depots combined to make the Redstone Arsenal. With the higher budget, they were able to build a rocket and missile center where von Braun and his colleagues worked on making the V-2 better, evolving it into the Redstone missile.

Later von Braun and his Huntsville team were allowed to make a multiple-stage version of the Redstone to carry warheads to more distant targets, called the Jupiter-C. President Dwight Eisenhower, however, was not very supportive of the space efforts and did not support the military rockets he was designing, so von Bruan's work was underfunded. The Navy also was designing a powerful rocket, called the Vanguard. As well as the Navy's competition, the Air Force was making a powerful booster named the Atlas.



A Jupiter-C ready for launch

Despite the American's efforts to reach space, the USSR had been working with more vigor and on 4



The *Sputnik* 1 satellite.

October 1957 they launched the first artificial satellite, Sputnik 1. The American public watched in awe as they saw, and some heard, the Soviet Satellite soar over their heads.

In an attempt to show that they, too, could build and successfully launch a satellite, on the 6th of December, 1957 the US launched the first Vanguard rocket. The engine lit with a thunderous roar and the spacecraft lifted four feet off the pad before exploding, the satellite at the top rolling away into the bushes. All this happened as millions of Americans watched on TV. Another launch of the Vanguard would be attempted about two months later with a similar fate, though this would not be televised.

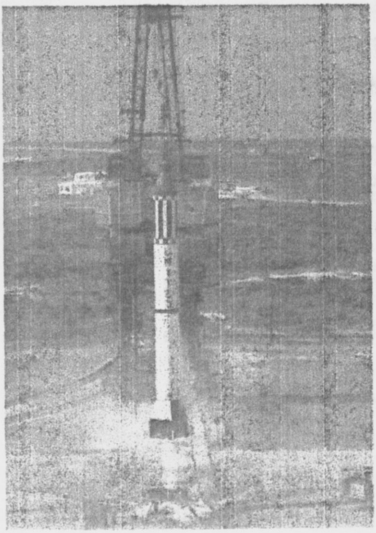
On the right von Braun holds a replica of an Explorer 1 satellite.

Then, on 31 January 1958, a white-body, black-tipped rocket stood ready for launch. This rocket was designed by Wernher von Braun and his team and was a four-stage version of the Jupiter-C, named the Juno, topped with an eight-foot long, 31-pound Explorer satellite. It took one and a half hours to confirm that the launch was successful and that the satellite had reached orbit, but it had, and von Bruan had succeeded.

The Mercury-Redstone

Once the Americans had gotten a satellite in space, they turned their attention to getting a person there. For this von Bruan and his Huntsville team, when they were not working on the larger Saturn project, worked on the Mercury-Redstone.

The Mercury-Redstone used a Jupiter-C first stage which was powered by hydyne fuel, a mixture of 60 percent unsymmetrical dimethylhydrazine (UDMH) and 40 percent diethylenetriamine (DETA). However, this was rejected by von Braun and his team because it would be more toxic in case of an accident and was changed back to what the standard Redstone was powered by, a mixture of 75 percent ethyl alcohol (an organic and alcoholic compound that is colorless and flammable) and 25 percent LOX compound (liquid oxygen).



Mercury-Redstone launch.

The most important change to the rocket was the addition of an abort system which could be activated either automatically or manually after the first 30 seconds, before then the only person or thing that could abort the mission was the Range Safety Officer.

Ham the Chimpanzee.

The first test flight made by the Mercury-Redstone was at Cape Canaveral on 21 November 1960. The launch failed and the rocket lifted four inches off the ground before crashing. The next test on 19 December 1960 went better, good enough that on the next launch, they sent Ham, a chimpanzee, up on 31 January 1961.

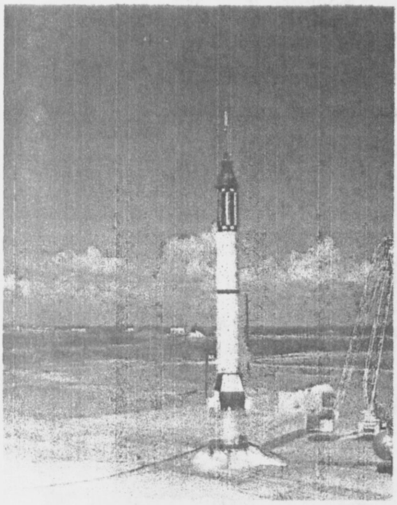
However, the flight with Ham did not go well and there were a series of problems. This caused von Bruan to insist that they do one more unmanned test before they risk a human's life. This test was on 24 March 1961 and was successful.

Despite von Bruan and his team's hard work, the Soviets had a head start and on 12 April 1961, they sent 27-year-old Yuri Gagarin into space. Yuri Gagarin orbited Earth one time on this historical flight, however, the flight was automated and Gagarin did not have to do anything.

Only three weeks later the Americans too sent a person into space. 37-year-old test pilot Alan Shepard

was launched into space on 5 May 1961 on a Mercury-Redstone in his Freedom 7 capsule. On his flight, though, he didn't orbit Earth, but he did control his ship and von Bruan had succeeded again. After Shepard's flight, there was only one more flight of the Mercury-Redstone: on 21 July 1961 Virgil "Gus" Grissom flew an almost repeat of the previous flight.

After Grissom's flight, there were only four more flights in the Mercury Program, all of which were launched with the Mercury-Atlas booster. The only one of the Mercury astronauts not to fly was Deke Slayton who was grounded because of medical problems.



A Mercury-Redstone ready for launch.

After Mercury was over Project Gemini was developed and launched two unmanned flights followed by ten manned flights, each carrying two astronauts. The launch vehicle was the Titan II and was not designed by von Bruan or his team.

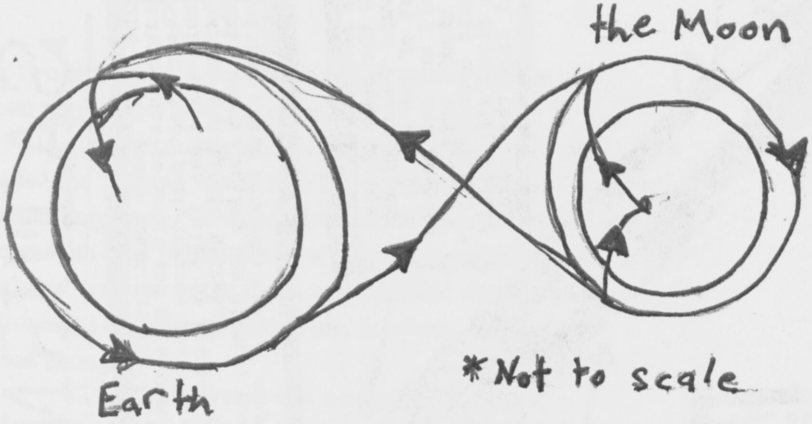
Kennedy's Moon Speach

On 25 May 1961, President John Fitsgerald Kennedy stood before Congress to propose that the United States of America "should commit itself to achieve the goal, before this decade is out of landing a man on the Moon and returning him safely to the Earth."

Then on 12 September 1962, before 40,000 people President Kennedy delivered another speech:

> We choose to go to the Moon. We choose to go to the Moon... We choose to go to the Moon in this Decade and other things, not because they are easy, but because they are hard; because that goal will serve to organize and measure the best of our energies and skills, because that challenge is one that we are willing to accept, one we are unwilling to postpone.

Kennedy giving his speech to a crowd of more than 40,000 people.



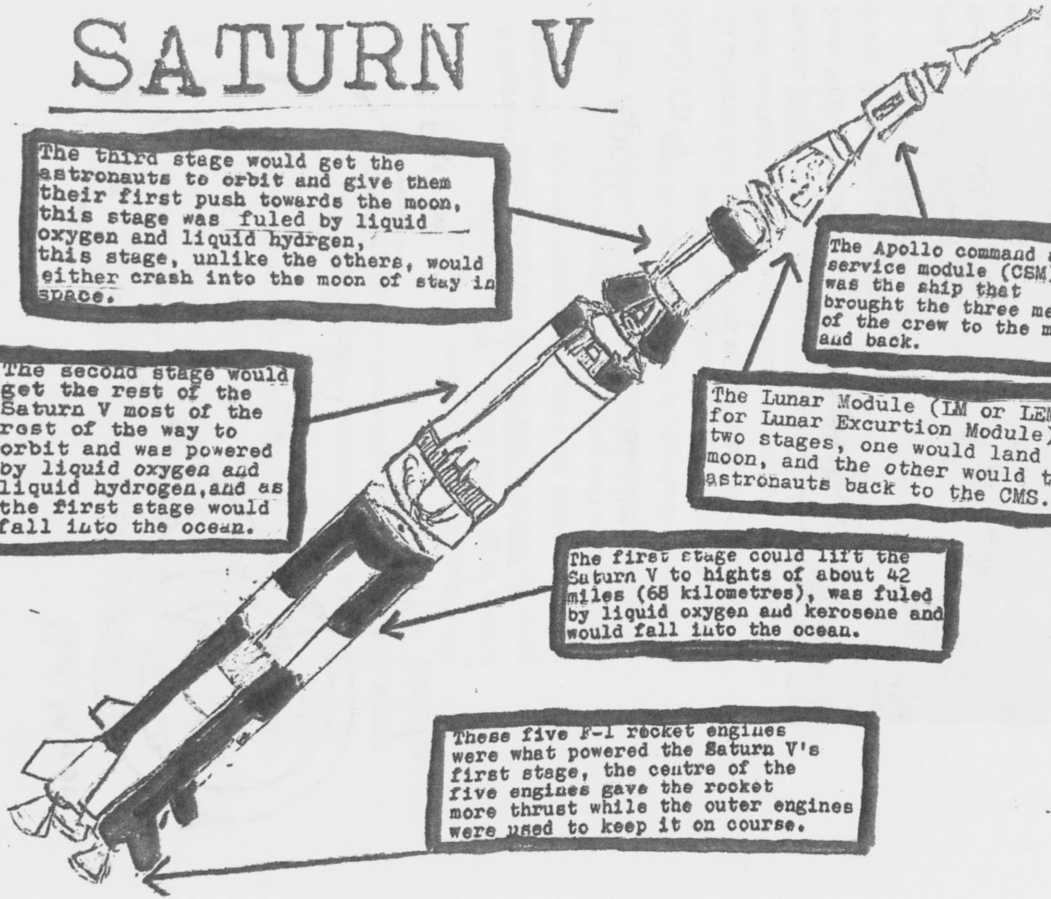
A diagram of LOR, the flight plan used for the lunar missions.

The Apollo Program and the Saturn V

To achieve that goal America would need a few things, most importantly more astronauts and a more powerful rocket. There were two more groups of astronauts, the New Nine and The Fourteen. As for the rocket, von Braun and his team got right to work.

Their first design was named the C-3 and at least two or three would be used in an Earth Orbit Rendezvous (EOR) which would entail multiple launch vehicles that would be assembled in space and then go to the moon in one piece, with all of it landing on the surface. Von Bruan preferred this method over the Lunar Orbit Rendezvous (LOR) where either one ship would be launched and part of it would detach in Lunar orbit and land on the moon before returning to the ship,

SATURN V



The third stage would get the astronauts to orbit and give them their first push towards the moon, this stage was fuled by liquid oxygen and liquid hydrgen, this stage, unlike the others, would either crash into the moon of stay in space.

The second stage would get the rest of the Saturn V most of the rest of the way to orbit and was powered by liquid oxygen and liquid hydrogen, and as the first stage would fall into the ocean.

The first stage could lift the Saturn V to hights of about 42 miles (68 kilometres), was fuled by liquid oxygen and kerosene and would fall into the ocean.

These five F-1 rocket engines were what powered the Saturn V's first stage, the centre of the five engines gave the rocket more thrust while the outer engines were used to keep it on course.

The Apollo command and service module (CSM) was the ship that brought the three members of the crew to the moon and back.

The Lunar Module (LM or LEM, for Lunar Excurtion Module) had two stages, one would land on the moon, and the other would take the astronauts back to the CMS.

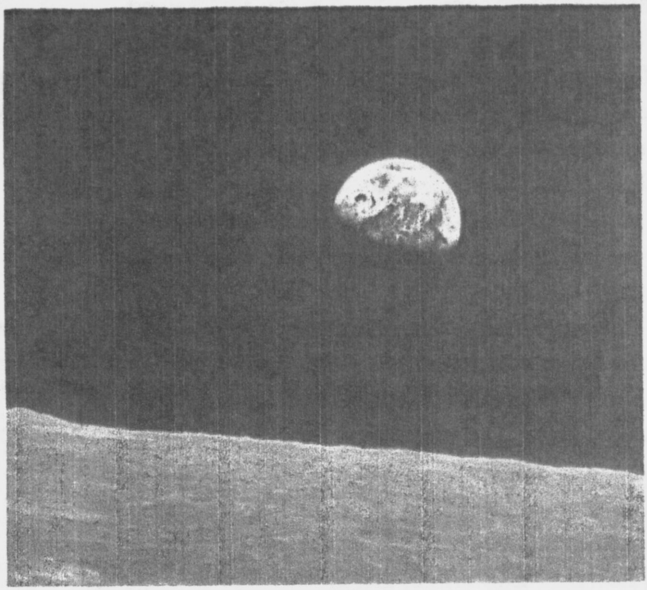
or two ships would go, one would go to the surface and then rendezvous with the other ship.

The next design that von Braun's team tried was called the C-4 and would also be used for EOR but would only need two ships. Each would have a first stage with four F-1 boosters, a second stage was an enlarged version of the C-3s, and the third stage would have one J-2 rocket engine. This, however, was not good enough.

The final version was named the C-5 and consisted of a first stage with five F-1 engines, the center one to give it more thrust and the four outer ones to keep it on course. The second stage would have five J-2s and the third stage would have one J-2.

The first manned flight in the Apollo program was supposed to be Apollo 1 with a crew of Gus Grissom, Edward "Ed" White, and Roger Chaffee when a horrible accident happened. It happened during a launch simulation on 27 January 1967. The Apollo 1 capsule had its atmosphere at 100% oxygen when one of the wires sparked causing a fire. The door was bolted as it would be in an actual launch and that is no easy thing to open. That, combined with a quickly spreading fire, meant none of the men made it out alive.

After that tragedy, Apollo 2 and Apollo 3 were canceled and Apollo 4 was unmanned as were the next two flights, Apollo 5 and Apollo 6. Finally, by Apollo 7 the launches were manned, and the crew was Wally Schira, Donn Eisele, and Walter Cunningham. They orbited Earth 163 times over the course of over 10 days, having launched on 11 October 1968 and landing on 22 October 1968.



The Earthrise, taken by Anders.

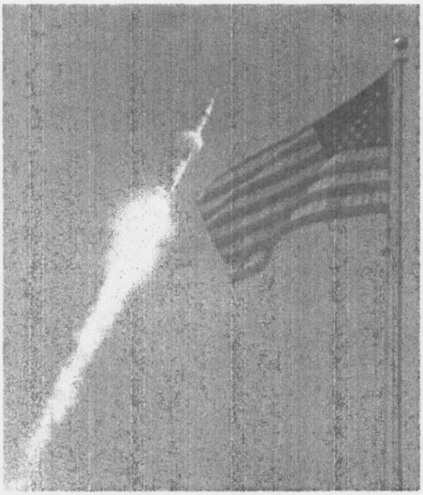
The next flight was Apollo 8, with Frank Borman, James Lovell, and William Anders. This flight was like none ever before, these three men would be the first to orbit the moon. This naturally would be a very dangerous mission, and none of them thought that they had a very good chance of getting back to Earth at all. But against all odds they made it back, alive,

Apollo 9 was not nearly as dangerous, it would test the Lunar Module (LM, previously LEM, for Lunar Excursion Module). Apollo 10 would be similar, except instead of testing the LM in Earth orbit, they would test it in Lunar orbit.

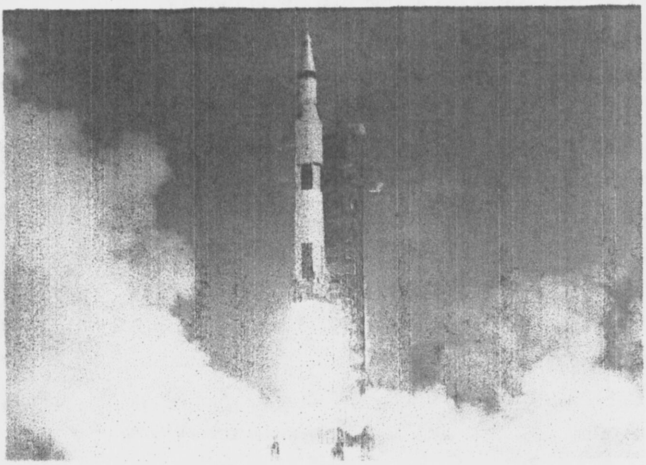
The next flight is the one that made history. Apollo 11 was launched on 16 July 1969 and was the first to land on the moon on 20 July 1969, with a crew of Neil Armstrong, Michel "Mike" Collins, and Edwin "Buzz" Aldrin. Only Armstrong and Aldrin would land on the moon while Collins would stay in Lunar orbit. Everything went well and they landed safely on the moon and made it back to Earth (see more on page 29).

Apollo 12 was similarly successful but that was not the case for Apollo 13. There were many problems on the mission and they barely made it back to Earth alive. They didn't get to land on the moon.

Apollo 14, however, was a success and Apollo



One of the most iconic photos of the Space race, an American flag in front of the Apollo 11 rocket.



A launch of the Saturn V.

15 even took a rover to drive around on. There were originally only going to be 20 Apollo missions, but President Richard Nixon canceled the last three missions, making Apollo 17 the last mission with a crew of Gene Cernan, Harrison Schmit, and Ronald Evens, Cernan, and Schmit going to the surface, in 1972.

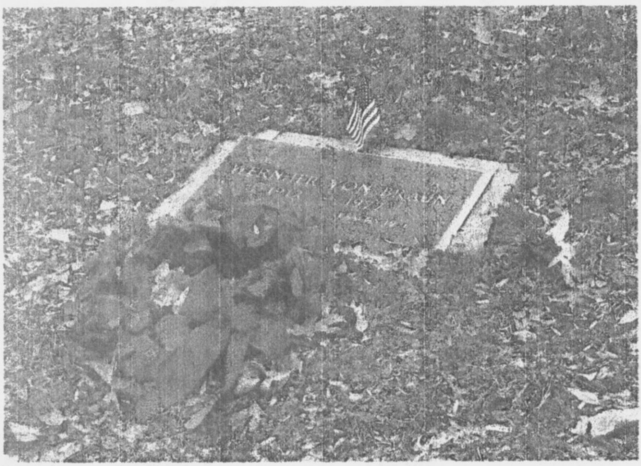
Wernher von Braun After Apollo

In March of 1970, von Braun and his family of a wife and three children were relocated from Huntsville, Alabama to Washington DC where von Braun became the Deputy Associate Administrator for Planning at the NASA headquarters.

However, he did not stay in that position for long. In May of 1972 von Braun retired from NASA and became Vice President for Engineering and Development of the aerospace company Fairchild Industries. He stayed at Fairchild until 1976 with dwindling health from kidney cancer that he had been diagnosed with in 1973, which at the time there was no cure for.

In early 1977, President Gerald Ford awarded von Bruan the highest scientific honor, the National Medal of Science in Engineering. Sadly, by that time von Braun was in the hospital and was unable to attend.

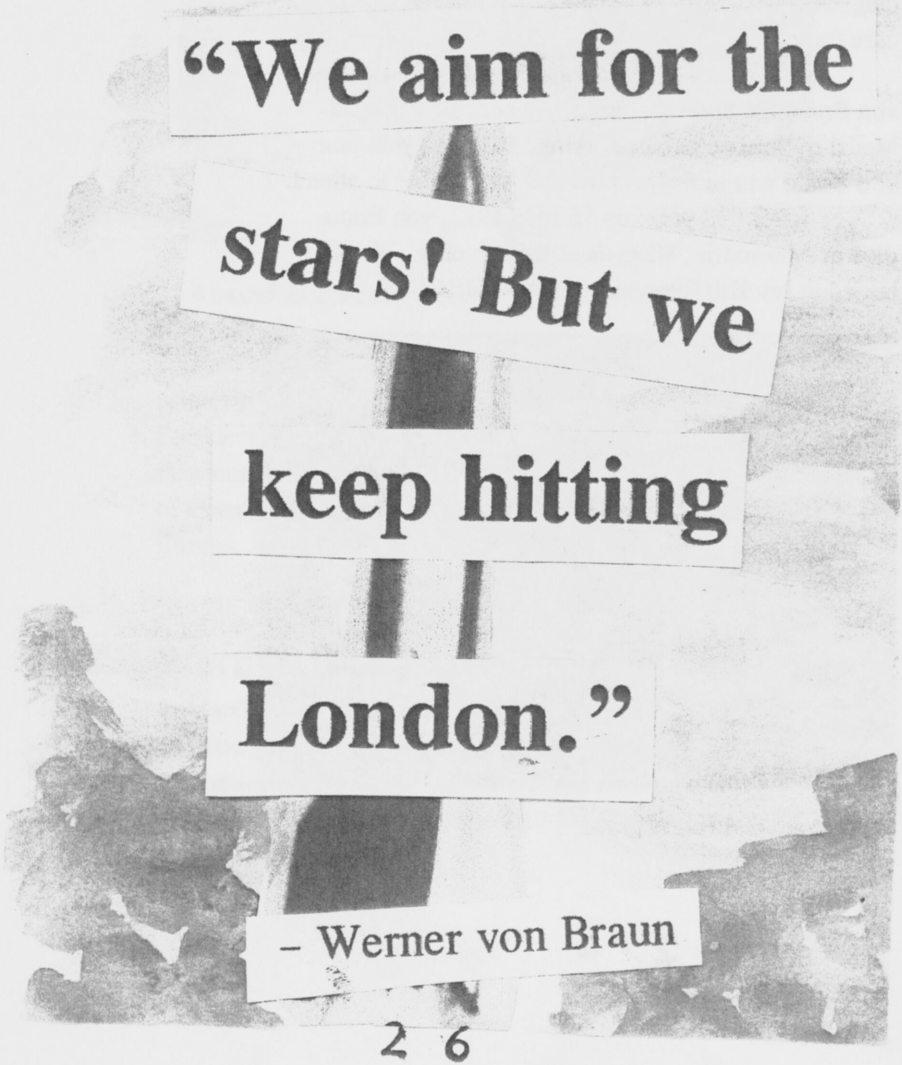
Later that year, on 16 June 1977, von Braun died in Alexandria, Virginia at the age of 65. He was buried at Ivy Hill Cemetary in Alexandria.



Wernher von Braun's grave.

Conclusion

So now that you know the story of von Bruan, what do you think? Did he really believe Nazi politics? Did he just want to go to space and was using the money of the Nazis to try and achieve that goal? Only von Braun could have truly answered those questions.



Puzzles and Fun

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W	G	B	M	O	O	N	H	A	U	D	X	M	P
G	A	P	O	L	L	O	O	F	I	F	M	C	G
F	G	A	T	G	T	F	W	I	W	J	D	T	L
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Apollo
Gemini
Mercury
Moon
Orbit
Capsule
Glenn
Space
Armstrong
Gagarin
SaturnV
Astronaut

Quiz

1. Who was the first person to go to space?
   A. John Glenn
   B. Gherman Titov
   C. Yuri Gagarin
   D. Alan Shepard

2. Who got the first satellite into space?
   A. Russia
   B. England
   C. Germany
   D. America

3. Who was the first person to land on the moon?
   A. Yuri Gagarin
   B. Neil Amstrong
   C. Edwin "Buzz" Aldrin
   D. John Glenn

4. When was the first V-2 launched?
   A. 1961
   B. 1941
   C. 1942
   D. 1934

5. The Saturn V was designed to _____.
   A. Go to Earth orbit
   B. Win World War II
   C. Go to the moon
   D. Go to Mars

6. When did Wernher von Braun die?
   A. 16 July 1977
   B. 16 July 1976
   C. 14 June 1976
   D. 16 June 1977

Neil Armstrong

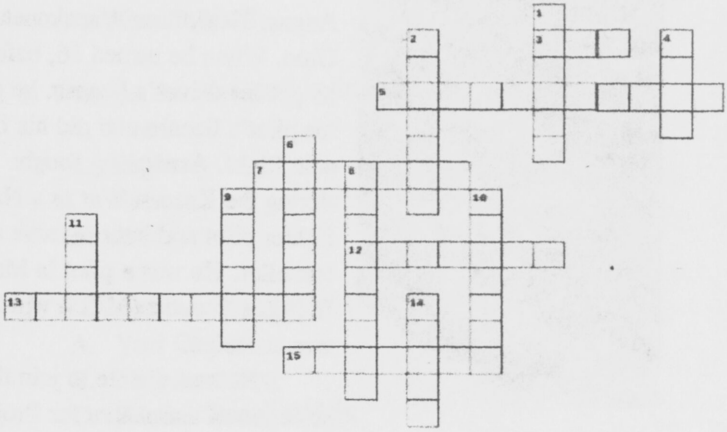
Neil Armstrong

Neil Armstrong was born on 5 August 1930, near Wapakoneta, Ohio. When he turned 16, before he got his driver's license, he got his pilot's license and did his first solo flight. Armstrong fought during the Korean War as a Navy fighter pilot and later became a test pilot. He was a pilot in Man In Space Soonest (MISS) which was canceled.

He was unable to join the selection of astronauts for Project Mercury, however, he joined in the first selection for Project Gemini. His first assignment was commander of the backup crew for Gemini 5 but he was not needed. His first flight was on Gemini 8 as commander. Gemini 8 had a problem, but they got it under control and both astronauts were safe.

His next and final flight was Apollo 11, the attempt at a first lunar landing. He and his crewmate Edwin "Buzz" Aldrin would be the two to land on the moon. Aldrin wanted to be the one to be the first to step out of the Lunar Module (LM), however, Armstrong was chosen to have the first steps on the moon. His famous words were "That's one small step for man, one giant leap for mankind." On the surface, Armstrong and Aldrin conducted a few tests and placed the American flag on the ground.

Armstrong died on 25 August 2012 in Cincinnati, Ohio. His remains were scattered in the Atlantic Ocean.



Down

1. Wernher von Braun was originally a(n) _____ scientist.

2. The first satellite sent to space by the Russians.

4. The month of the first landing on the moon.

6. The place where the astronauts could be in space without a suit.

8. The first person on the moon.

9. The third American space program and the first to land astronauts on the moon.

10. The first American space program.

11. A natural satellite.

14. The first American to orbit the Earth.

Across

3. Wernher von braun prefered it over LOR

5. The ship that would land people on the moon.

7. The first man in space was Yuri ____.

12. The rocket that got people to the moon.

13. During most of the Space Race, von Braun worked in _____.

15. "We choose to go to the Moon in this decade and do other things, not because they are easy but because they are hard"-President _____.

The satirical song performed in 1967

Wernher von Braun

By Tom Lehrer

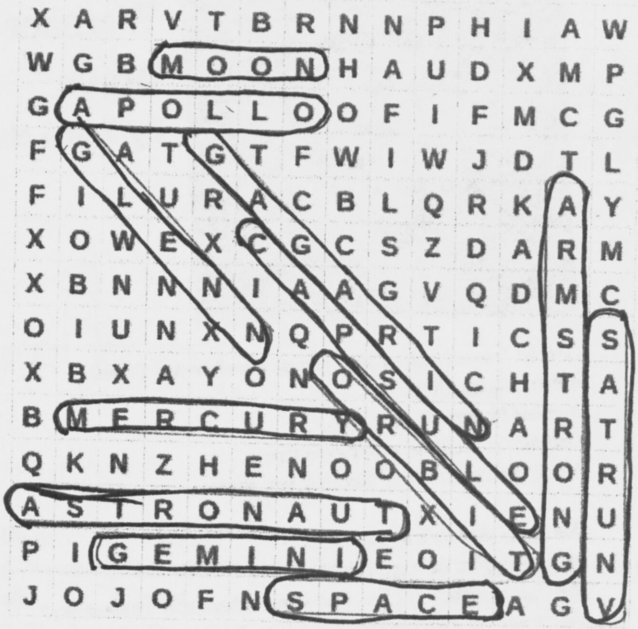
Gather `round while I sing you of Wernher von Braun
A man whose allegiance
Is ruled by expedience
Call him a Nazi, he won't even frown
"Nazi, Schmazi!" says Wernher von Braun.

Don't say that he's hypocritical
Say rather that he's apolitical
"Once the rockets are up, who cares where they come down?
That's not my department!" says Wernher von Braun.

Some have harsh words for this man of renown
But some think that our attitude
Should be one of gratitude
Like the widows and cripples in old London town
Who owe their large pensions to Wernher von Braun.

You too may be a big hero
Once you've learned to count backwards to zero
"In German, oder Englisch, I know how to count down
Und I'm learning Chinese!" says Wernher von Braun.

Answer Key



1. C. Yuri Gagarin went to space on 12 April 1961.

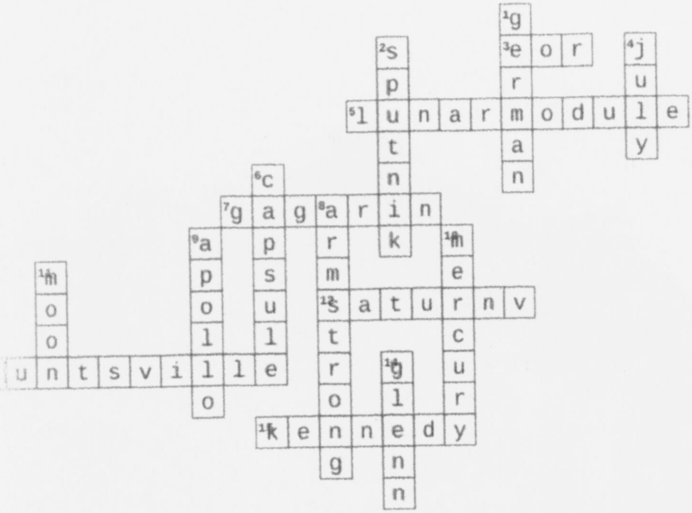
2. A. Russia launched the first satellite into space on 4 October 1957.

3. B. Neil Armstrong landed on the moon on 20 July 1969.

4. C. The first V-2 was launched on 3 October 1942.

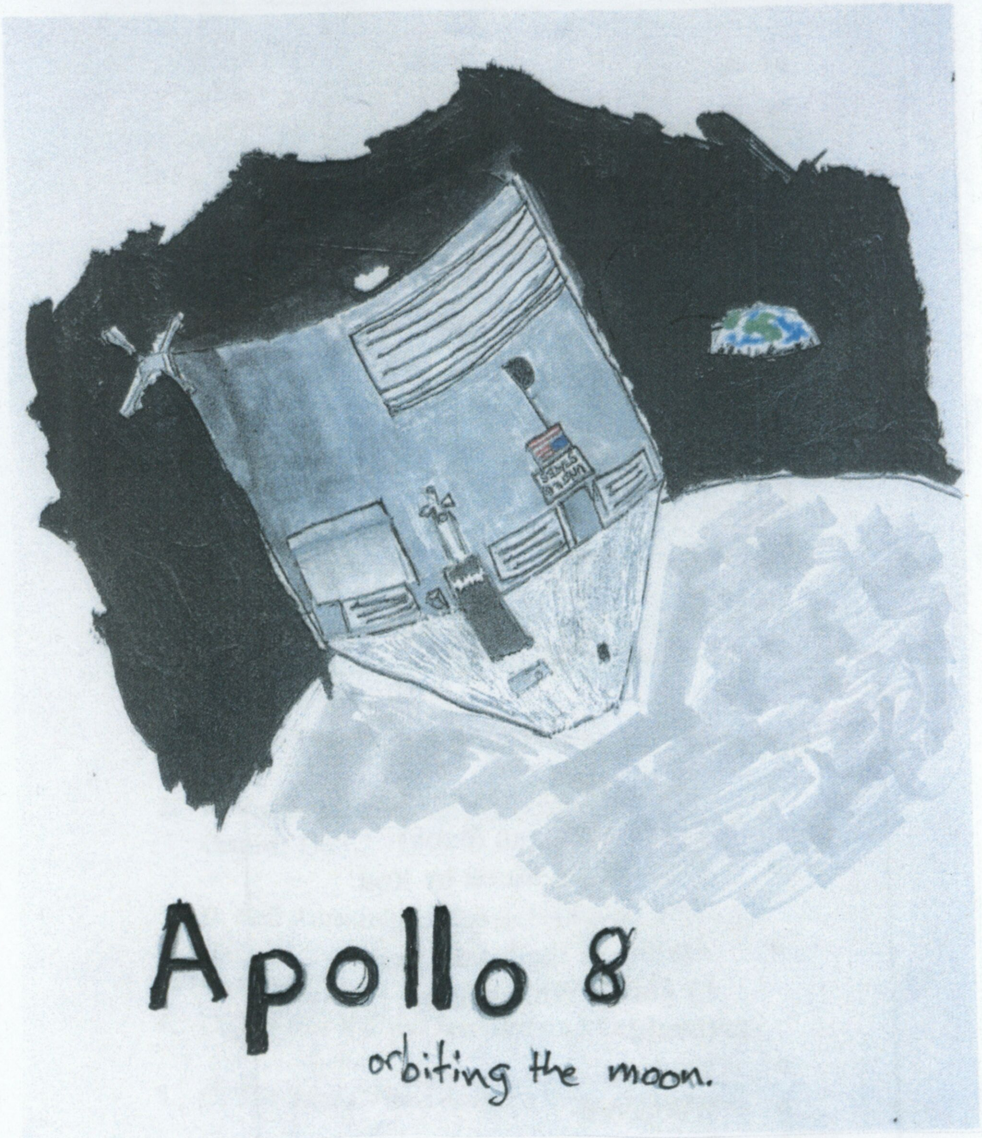
5. C. The Saturn V was designed to go to the moon.

6. D. Wernher von Braun died on 16 June 1977 due to kidney cancer.



Sources

- Shoot for the Moon by James Donovan (book)
- First on the Moon by Rod Pyle (book)
- Apollo 11 the Inside Story by David Whitehouse (book)
- Youtube
- Wikipedia
- Space.com


Apollo 8
orbiting the moon.