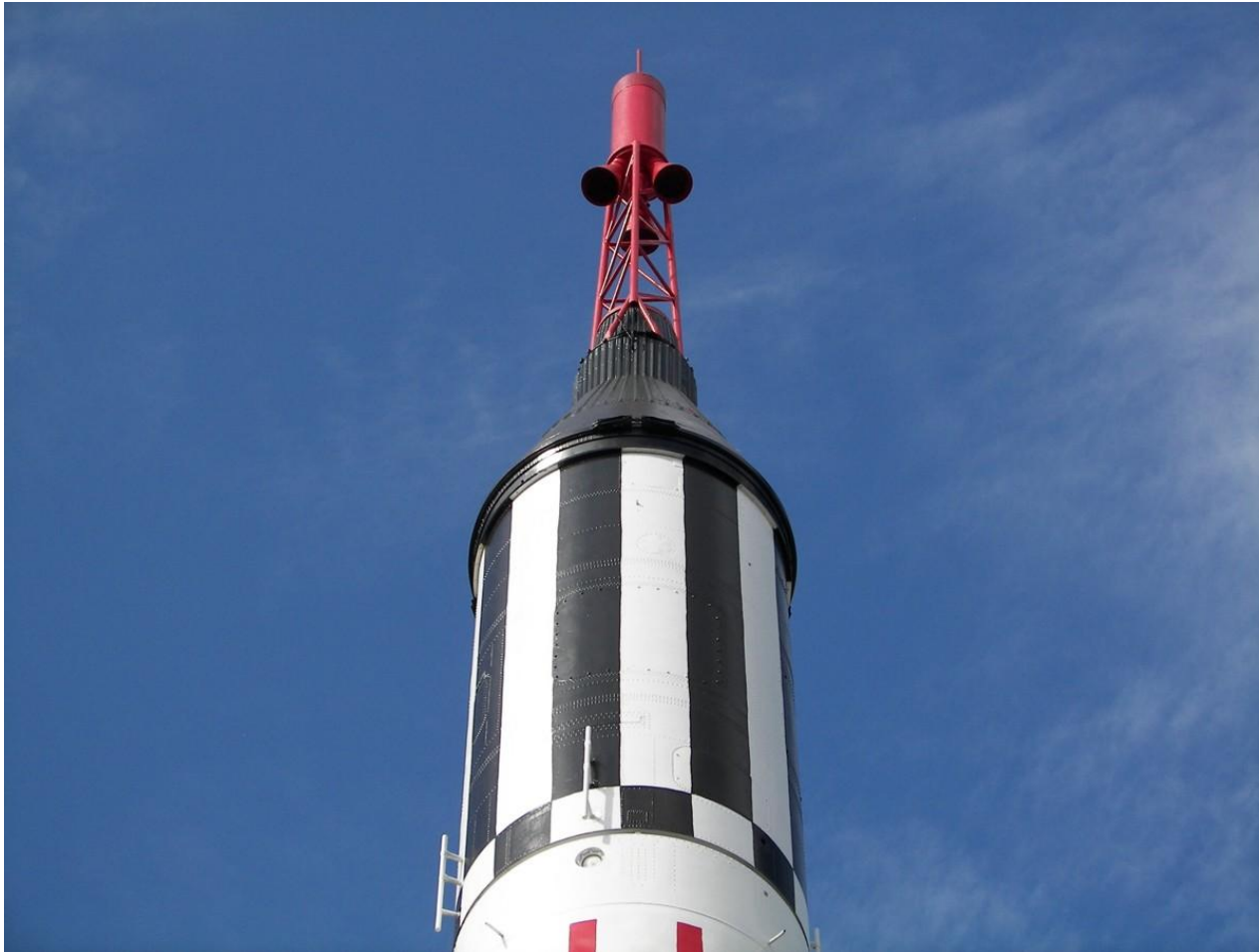


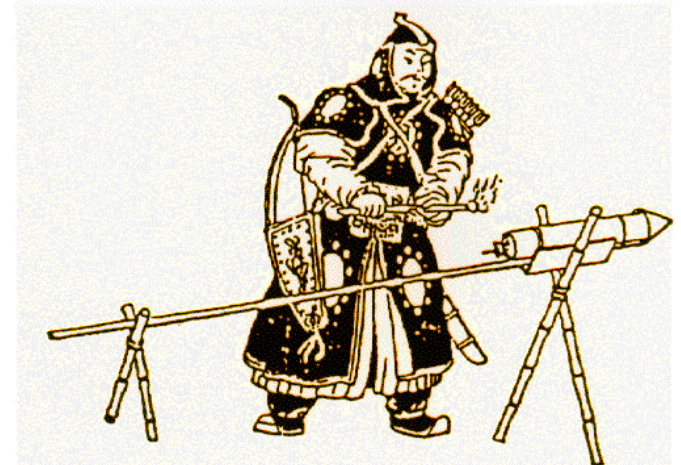
CAP Model Rocketry Redstone Phase



Capt. Jared Deisinger, CAP
SWR-TX-391

A Brief History of Rocketry

- The Chinese experimented with explosive powders in the 1st century AD made of saltpeter, sulfur and charcoal
- Powders were mostly used in religious festivals, but also used in weapons as well.
- "Fire Arrows" were bamboo tubes filled with explosive powder and attached to large arrows.
- Used successfully to repel Mongol invaders at the Battle of Kai-Keng in 1232.



A Brief History of Rocketry

- Konrad Keyser von Eichstadt of Germany developed a rocket propelled by gunpowder in 1405 (gunpowder having been also developed in China and spread west)
- Rocketry made more appearances in the battlefield as the technology moved from East to West
 - Used by French to defend Orleans from British attack in 1429 and during the siege of Pont-Andemer in 1449 during the Hundred Years War
 - Used by both sides during the Thirty Years War (1618-1648), with some weighing up to 100 lb.
 - Used by the British in India during the Battles of Seringapatam (1792 and 1799) and by Indian forces against the British during other conflicts of the period (Third and Fourth Anglo-Mysore Wars)

A Brief History of Rocketry

- After witnessing effective use of rockets by Indian forces against British troops in the Third Anglo-Mysore War, Colonel William Congreve took notice.

- Congreve used a more scientific approach to rocket design and development, based on physics research done by Sir Isaac Newton
- Congreve standardized composition of gunpowder used for propulsion, then added flight-stabilizing sticks.
- Congreve's rockets were more accurate and were able to extend max range from 300 to more than 3,000 yards, a 1,000% increase
- Nearly 25,000 Congreve rockets were used by British during their victory over the Dutch at the Second Battle of Copenhagen in 1807.

A Brief History of Rocketry

- British forces made use of rockets during sieges of American emplacements during the War of 1812.
- The use of such rockets, and the sight they made in the sky, inspired one witness of 1814's Battle of Fort M'Henry to write a poem about the spectacle. This poem was later used by it's author, Francis Scott Key, when he wrote "The Star-Spangled Banner."



A Brief History of Rocketry

- Another Englishman, William Hale, developed spin stabilization to further increase rocket's accuracy.

- Hale used angled vanes in the rocket's exhaust to cause the rocket to spin in flight like a bullet, allowing the stabilizing stick to be removed.



- These rockets were first used in anger by American forces during the Mexican-American War (1846-1848); they were not officially adopted by the British until 1867.

- While military rocket technology continued to improve, its use was small compared to conventional artillery, which was still much more accurate.

- Beginning in the late 19th century, a few members of the scientific community began to seriously study manned space flight using rocket propulsion.

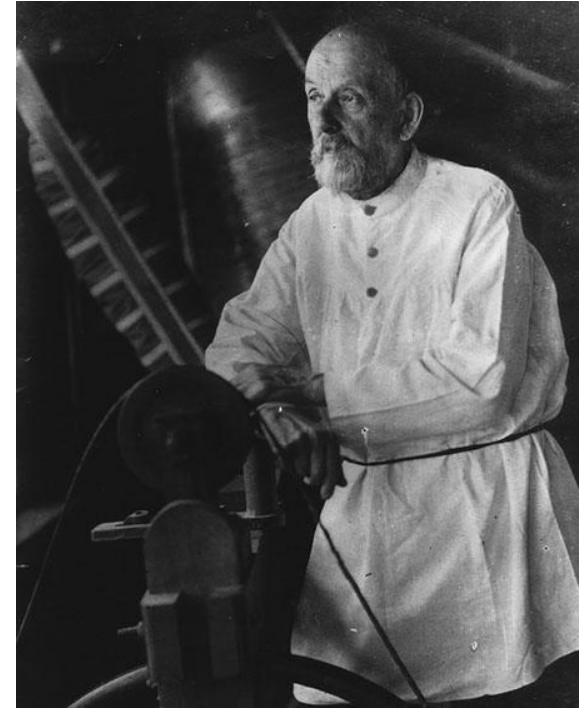
Konstatin Eduardovich Tsiolkovsky

(1857-1935)

- Left nearly deaf from a bout of scarlet fever during childhood, Konstatin proved a good scholar and was sent to Moscow to continue his studies.

- Inspired by a friend to research "cosmism" he read, among other texts, Jules Verne's "From the Earth To The Moon". This book would inspire Konstatin, and many other young scientists, to have a lifelong interest in space travel.

- Konstatin discussed concepts such as weightlessness, the vacuum of space and use of gyroscopes for rocket control in *Svobodnoe Prostranstvo* or "Free Space" which was not published until after his death.



Konstatin Eduardovich Tsiolkovsky

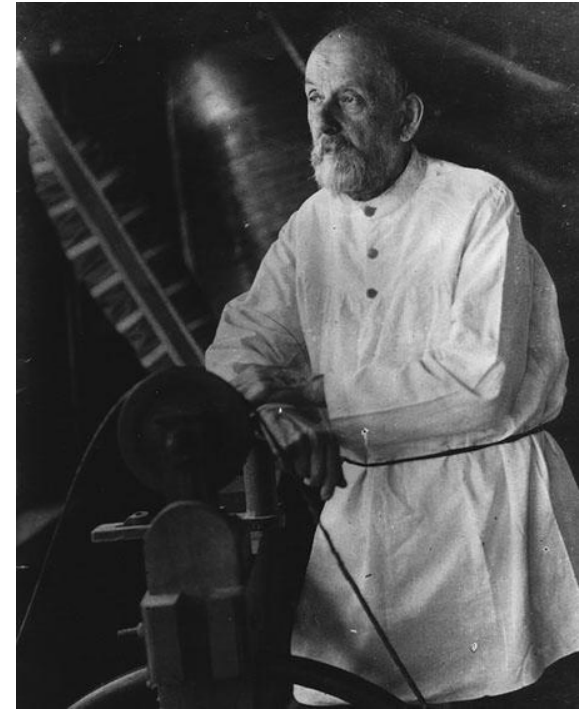
(1857-1935)

- Konstatin's next work, an article titled "The Exploration of the World Space with Jet Propulsion Instruments" was published in 1903. It is considered the first true, scientifically-based proposal for space exploration.

- In it, Konstatin "formulated relationships between the changing mass of a rocket as it burned fuel, the velocity of exhaust gases and the rocket's final velocity". He also discussed use of a rocket engine using liquid hydrogen and liquid oxygen as fuel.

- In later works, "he spoke of multi-stage rockets, rocket-powered airplanes, an orbiting space station and eventually colonization of the galaxy."

- Due to his work, and despite never having built a rocket, Tsiolkobsky is considered the Father of Space Travel.



Hermann Oberth

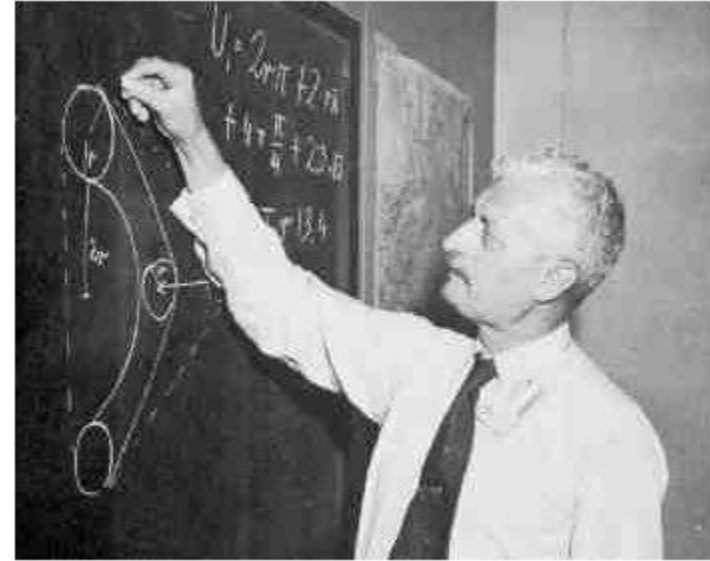
(1894-1989)

- Born in Hermannstadt, Transylvania, part of Austro-Hungary (now Sibiu, Romania) Oberth was also inspired to study space travel by reading Jules Verne's "From the Earth To The Moon."

- Hermann published his graduate thesis, "The Rocket into Planetary Space" in 1923. It "covered concepts such as a rocket's fuel consumption, fuel handling hazards, the dangers of working with solid propellants and the possible hazards to humans." He, like Tsiolkovsky, also proposed the use of multi-stage rockets to reach space.

- Oberth went on to work closely with Werner von Braun in the 1930s and assisted him in developing the V2 rocket.

- He later joined von Braun at the US Army's Ballistic Missile Agency following WWII to continue their work.



Robert H. Goddard

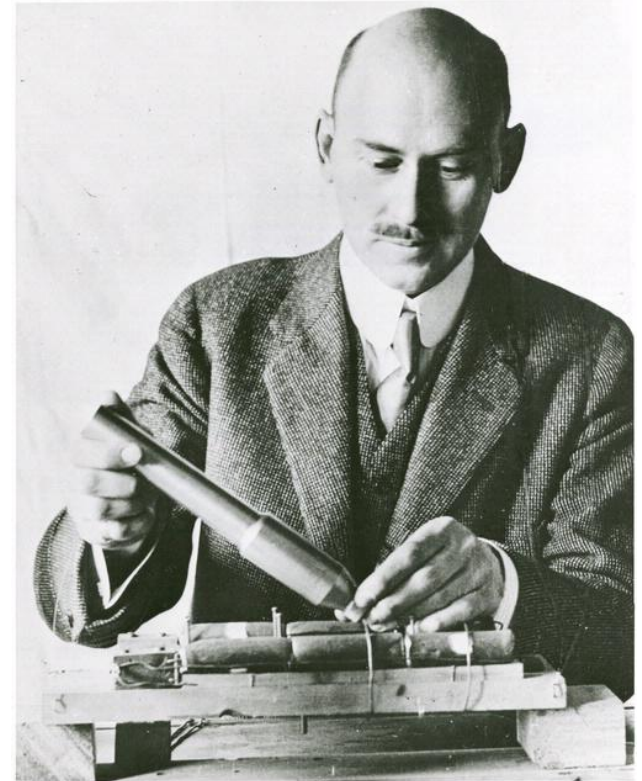
(1882-1945)

- Born and raised in Worcester, Massachusetts, Goddard was interested in nature and space from a young age.

- He worked with Dr. Gordon Webster, a well-known physicist during his graduate studies, giving him great exposure to the sciences; he would go on to get a PhD and work at Clark University, his alma mater.

- After much work, he launched a liquid-propelled rocket from a field near Worcester, Massachusetts on March 16th, 1926.

- Though Goddard's rocket flew for only 2.5 seconds and reached only 41 feet, it proved the viability of liquid-fueled rockets. His rocket could be controlled, unlike solid-fuel rockets that must burn all their fuel once they are lit.



Robert H. Goddard

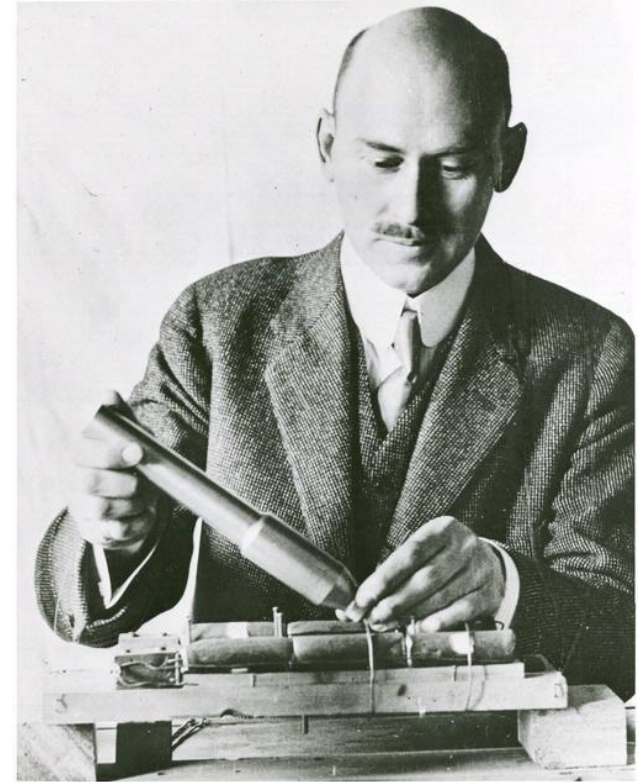
(1882-1945)

- Goddard had previously worked with solid rockets, having been given a grant from the US Army during WWI to research the technology. One piece of work, which involved firing a solid-fuel rocket through a three-inch tube, would eventually be developed into the bazooka.

- Goddard later moved to Roswell, NM to escape media ridicule while he continued his experiments, largely funded by the Guggenheim Foundation. Such work "included fuel feeding devices, propellant pumps, gyroscopic stabilizers, and instruments for monitoring the flight of rockets." It was here that Charles Lindbergh witnessed his work.

- Though seen as largely insignificant by the American scientific community, his work was closely watched by German scientists that saw much more use for it.

- Goddard would later work with the US Navy to developed rocket-powered assisted-takeoff devices for aircraft.



Dr. Werner von Braun

(1912-1977)

- Interested in rocketry from an early age and a fan of Jules Verne & H.G Wells, von Braun was a follower of Oberth and received a PhD in physics.

- He worked as team leader for the group that developed the V-2 ballistic missile in Germany during WWII.



- Standing 46 ft high and weighing 27,000 lb, the liquid fueled V-2 could reach speeds of 3,000 mph while delivering a 2,200 lb warhead to a target 500 miles away.

- At the end of the war, von Braun got many of his scientists to surrender to the Americans rather than the Russians, bringing their technology with them.

- von Braun spent the next 15 years developing ballistic missiles for the US Army under Operation Paperclip at Ft. Bliss, TX and White Sands, NM before moving to Redstone Arsenal.

Dr. Werner von Braun

(1912-1977)

- When the rocket project moved from Army responsibility to NASA authority, von Braun was tasked with the development of the Saturn rocket, including the largest, the Saturn V.

- von Braun became a leading spokesman for space exploration. In 1970, he moved to Washington, DC to head up strategic planning efforts before retiring in 1972.



Sources

<http://militaryhistory.about.com/od/warof1812/p/ftmchenry.htm>

http://helpmejoseph.typepad.com/charlotte_front_and_cente/images/2008/07/04/4_mural_fort_mchenry.jpg

[http://en.wikipedia.org/wiki/William_Hale_\(British_inventor\)](http://en.wikipedia.org/wiki/William_Hale_(British_inventor))

<http://lowres-picturecabinet.com.s3-eu-west-1.amazonaws.com/43/main/36/115080.jpg>

http://z.about.com/d/space/1/0/V/0/1/fire_arrow.gif

<http://www.allstar.fiu.edu/aero/images/Tsiolkovsky.jpg>

http://capmembers.com/media/cms/Stage_1_Redstone_944AF619A90ED.pdf

https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcRS_cXNrXAaDXEX0a-EQfdFDWWGFFtlwgRcr0Xb-SED436niQF-IQ

https://en.wikipedia.org/wiki/Robert_H._Goddard

https://encrypted-tbn1.gstatic.com/images?q=tbn:ANd9GcRZDyvwROU8pMQCX7_0Mb1nEKq781I31xOVLKtJS3P1aI60IaM1

http://historicspacecraft.com/Photos/Mercury-Redstone_USSRC_2007_RK_1.jpg

http://www.nasa.gov/images/content/363428main_von_braun.jpg