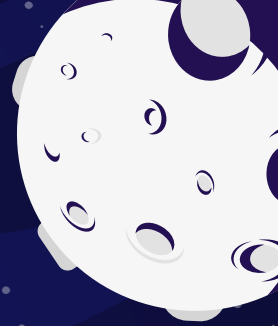


AEROSPACE MODULES 4-6



Rockets, Space Environment, Spacecraft
Presented by C/CMSgt Menk



The background is a dark blue space scene filled with numerous small white stars and several larger, bright four-pointed starburst patterns. A large, white, wavy, cloud-like shape is positioned on the left side of the frame. A dashed purple line curves across the middle of the image, separating the title area from the subtitle area.

MODULE 4

Rockets

MODULE 4'S CHAPTERS



1. HISTORY OF ROCKETS

Origin → Modern
Rocketry, Space Race



2. ROCKET PRINCIPLES, SYSTEMS, & ENGINES

Principles, Motion Laws,
Systems, Land SPEED



3. ROCKET & PRIVATE SPACE TRAVEL

↑Pretty self-explanatory↑

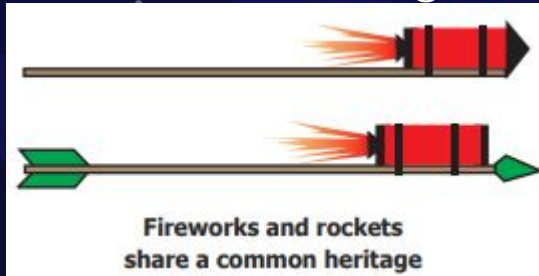


01

HISTORY OF ROCKETS

Chapter 1: History

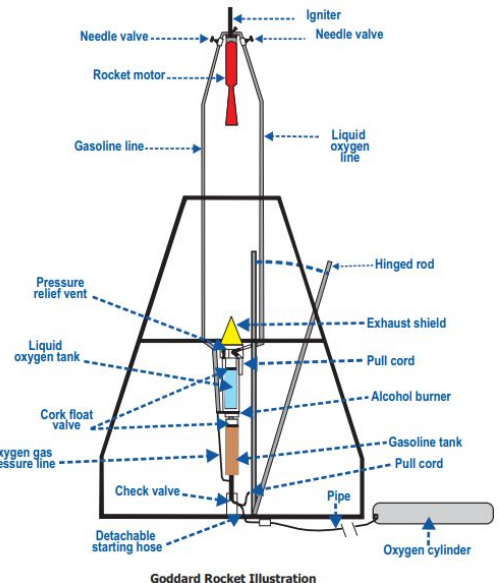
- Began around 400 B.C. with Archytas's wooden p...
- 300 yrs later, Hero made first rocket engine
- AD Chinese experiment with gunpowder-filled tu...
- 13-15th centuries: Roger Bacon improves gunpow...
- Froissart improves accuracy with tubes
- Newton's Laws
- Britain's Congreve rockets- 3,000 yds!
- English William Hale developed spin stabilization



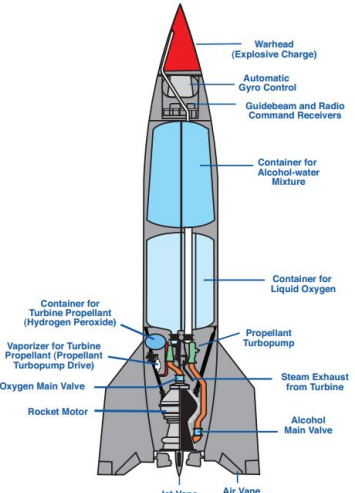
Congreve Rocket



Chapter 1: Modern Rocketry



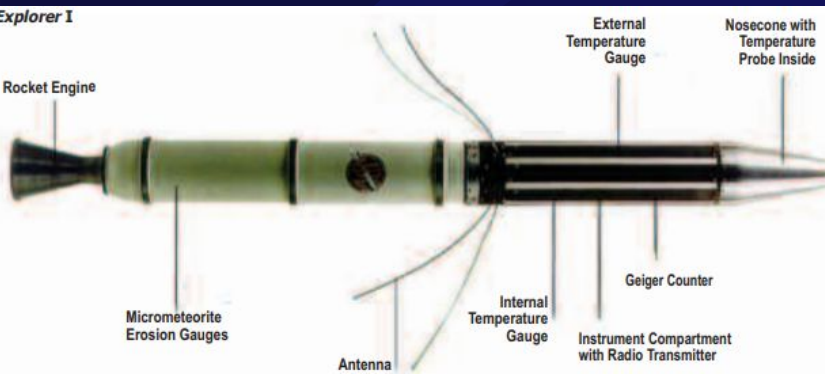
Goddard Rocket Illustration



- 1898 Tsiolkovsky wants space exploration by rocket
- Goddard experiments with solid-propellant and liquid-propellant, as well as multi-stage rockets. “Father of Modern Rocketry”
- Hermann Oberth writing about space exploration leads to V-2 development, built under Wernher von Braun
- Sergei Korolev Father of Soviet Space Program

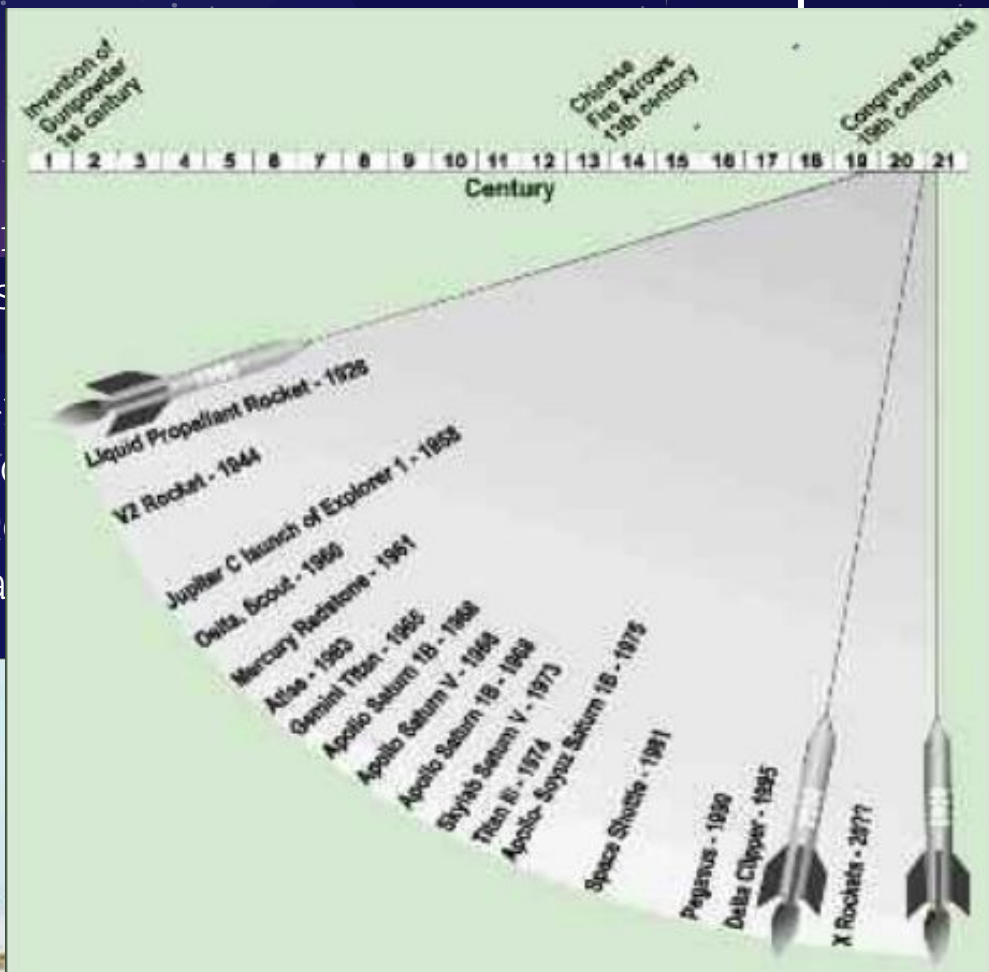
CHAPTER 1: SPACE RACE

- US vs Soviet Union
- US starts with all ranges of missiles. Missiles would launch things to space
- Soviet Union launches Sputnik I, Oct 4, 1957
- US launches Explorer I, Jan 31, 1958
- US establishes NASA
- April 1961 Yuri Gagarin first man in space, then Alan Shepard first American in space



1: SPACE RACE

- John Glenn
- Gemini miss
- members
- Apollo 1967-
- Neil Armstr
- Skylab spac
- System- Spa



Alan Shepard's Mercury capsule atop Redstone rocket



John Glenn's Mercury capsule atop an Atlas launch vehicle

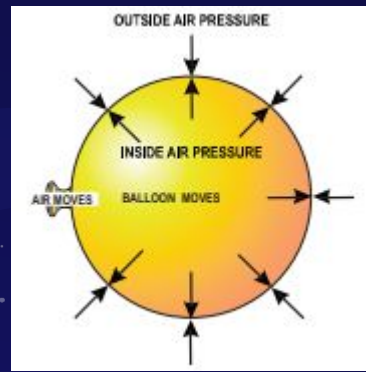


The background is a dark blue space scene with various shades of blue and purple nebulae and numerous white stars of different sizes and brightness. A white rectangular box is positioned on the left side, containing text. A thin white vertical line extends from the top of the box to the top edge of the frame.

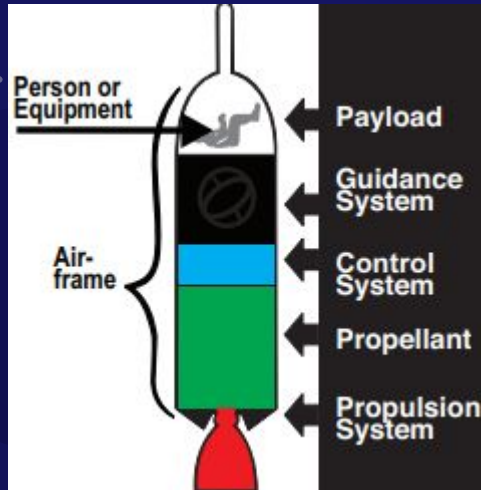
02

**ROCKET PRINCIPLES,
SYSTEMS, & ENGINES**

Chapter 2: Principles & Systems

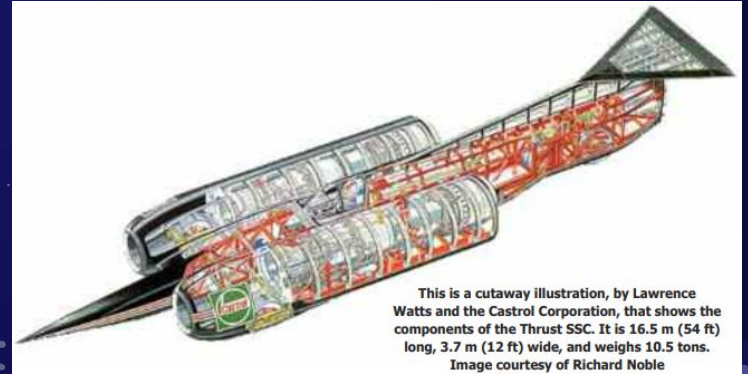


- Pressurized gas chamber
- Newton's Laws: Thrust, Inertia, Acceleration, Third Law
- Systems: Payload, Airframe, Guidance, Control, Propulsion,



Chapter 2: Engine and SPEED

- Rockets do more for less
- Someone thought, this would be fun with a car... 1000 miles. per. hour.
- Blue Flame- 50k lb thrust, 622.407 mph
- British Thrust SSC, 763 mph
- American Bloodhound SSC- 1000?



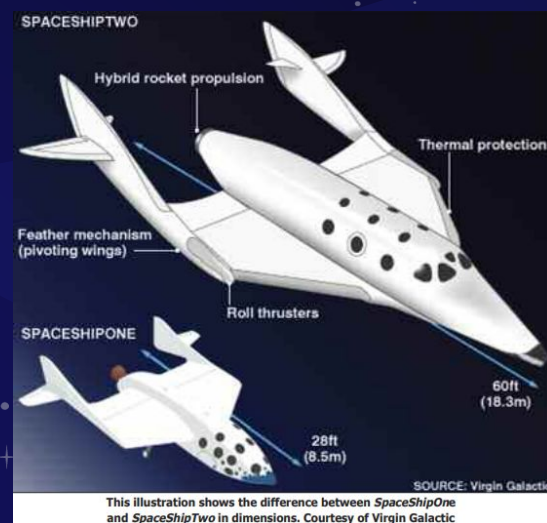


03

**ROCKETS & PRIVATE
SPACE TRAVEL**

Chapter 3

- 1995 Diamandis makes Ansari X-Prize, encouraging private space flights
- 62 miles is beginning of space
- 2004 Melville flies SpaceShipOne to 69.2 miles
- Commercial Space Flight? Virgin Galactic



The aerospace "mother ship," known as "White Knight" is shown here carrying SpaceShipOne on a test flight. Image courtesy of Mojave Aerospace Ventures, LLC



WhiteKnight II and SpaceShipTwo in flight in preparation for launch – Image courtesy of Virgin Galactic

MODULE 5

Space Environment



MODULE 5'S CHAPTERS



1. SPACE

What is it like? What does it contain?



2. STARS

Characteristics & life cycle



3-4. OUR SOLAR SYSTEM

Sun, Moon, Other Planets

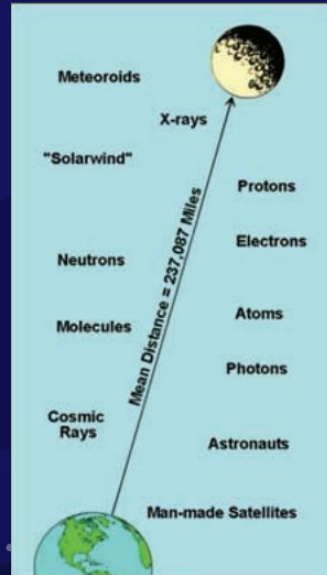


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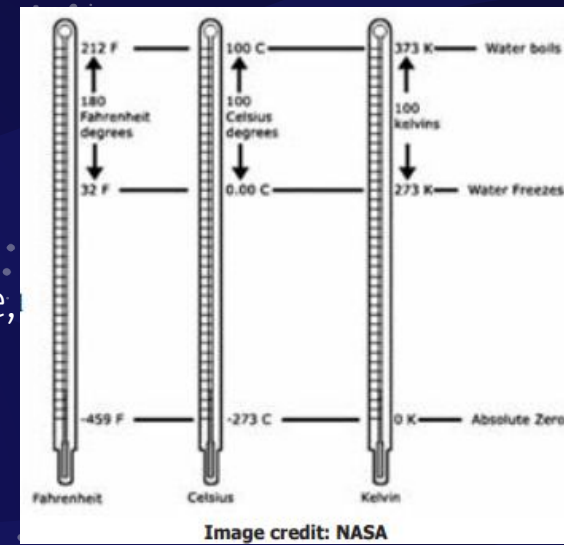
SPACE

Chapter 1

- Space is a wonder
- Space is a Place- AF & NASA define 50 miles
- Space Characteristics: Vacuum, Oxygen, Pressure, Temperature, Gravity
- Space Regions: Cislunar, Interplanetary, Interstellar
- Galaxies



Dimensions and occupants of cislunar space

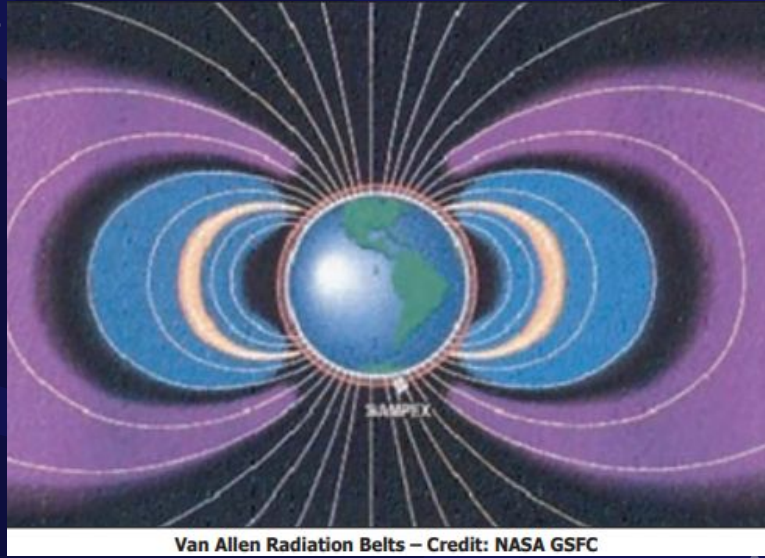


Milky Way Galaxy - spiral galaxy

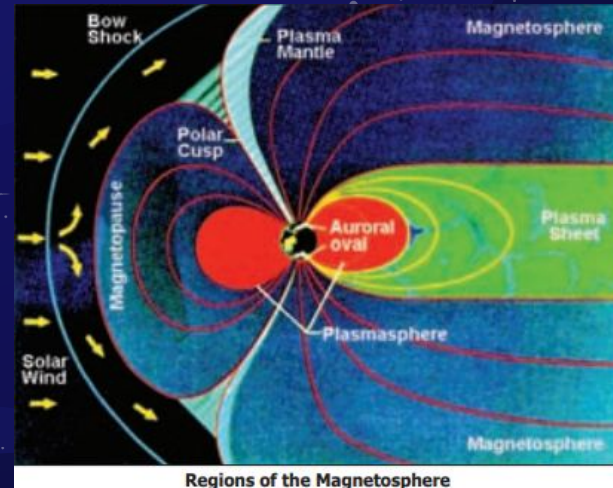


Elliptical galaxy

Chapter 1: Space around the Earth



- Magnetic Field
- Van Allen Radiation Belts- Inner & Outer; danger to Astronauts
- Magnetosphere & Solar Winds
- Aurora Borealis & Ionosphere



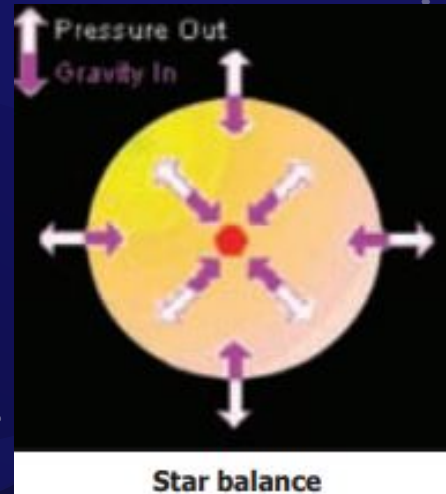
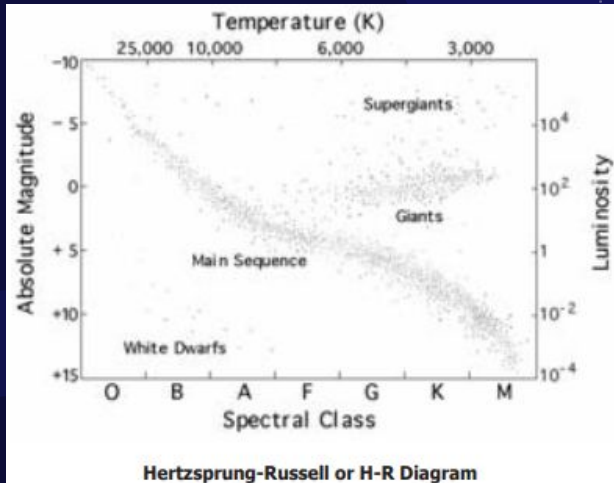


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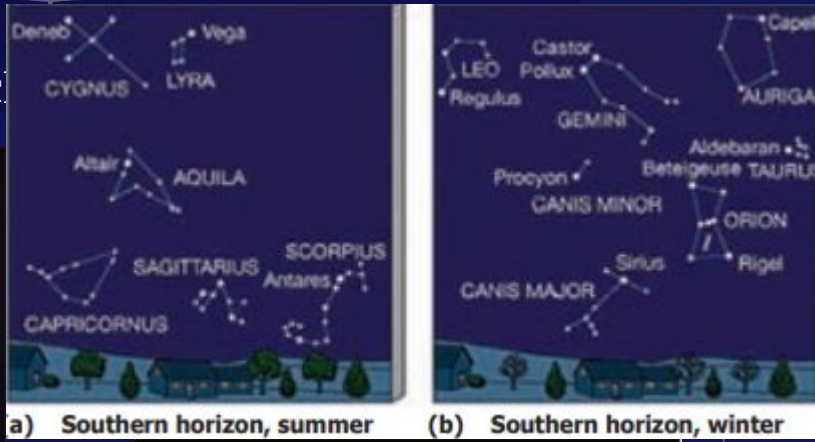
stars

Chapter 2

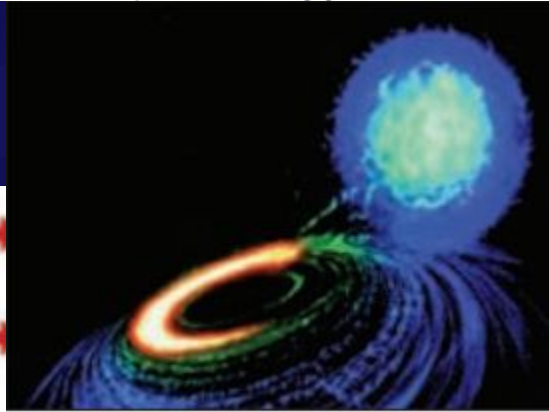
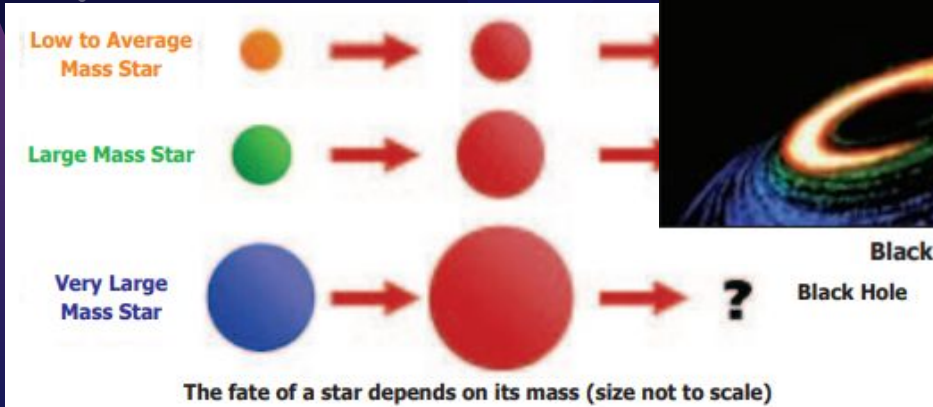
- Stars
- Light Years & Parsecs
- Star Magnitudes- apparent vs absolute, H-R Diagram
- Star's Life- nebulae, needs fuel



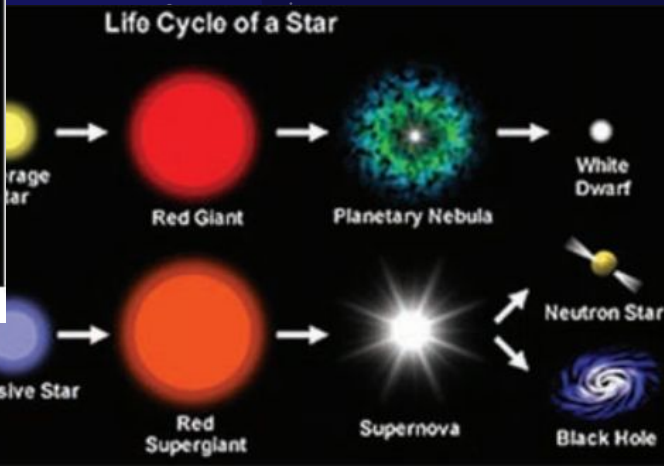
Chapter 2: Star Life Cycle



Pulsar is in the center of the supernova Kes 75



Black Hole



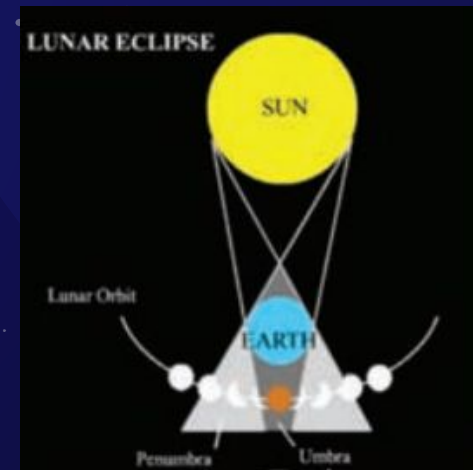
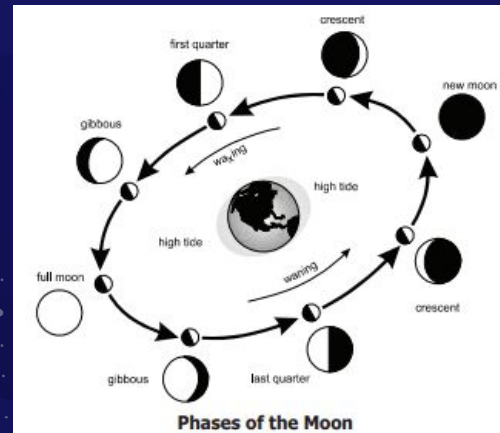
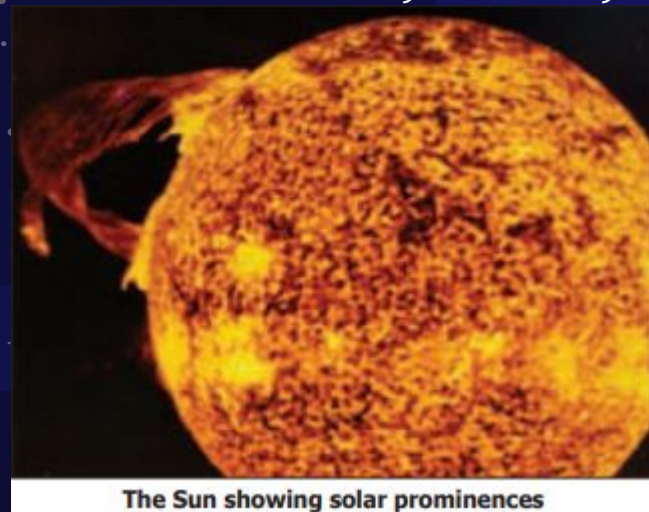
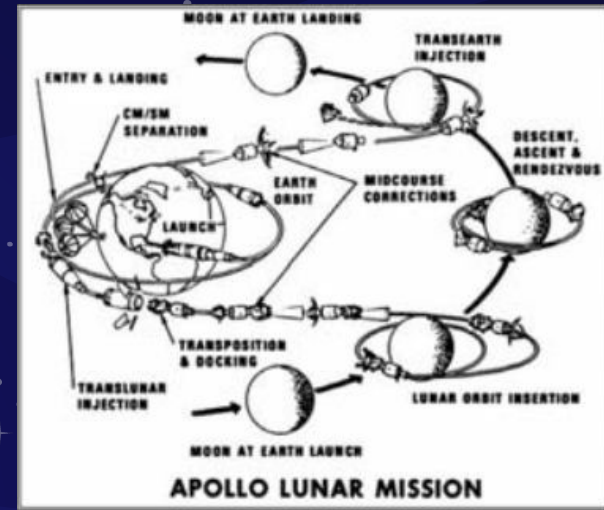


03-04

our solar system

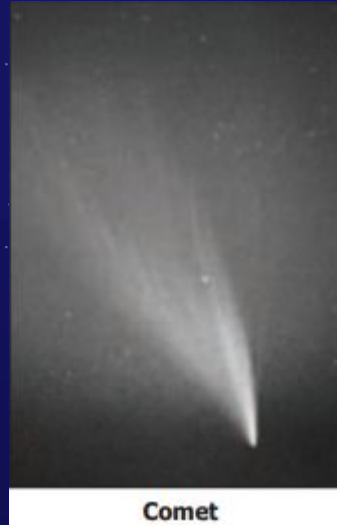
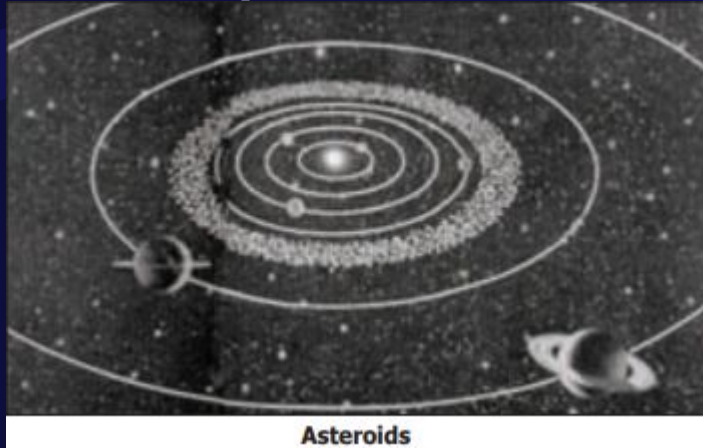
Chapter 3: Our Solar System

- Our solar system: Sun, planets + satellites, asteroids, comets, celestial bodies
- Sun is most important. Photosphere, Sunspots, Solar Flares, Solar Prominences
- Astronomical unit
- Moon & its gravity, water?, terrain, Moon day is 27 days



Chapter 3: Our Solar System

- Other Bodies: Asteroids, Comets, Micrometeorites, Meteoroids, Meteors, Meteorite



Chapter 4: Planets



Mercury

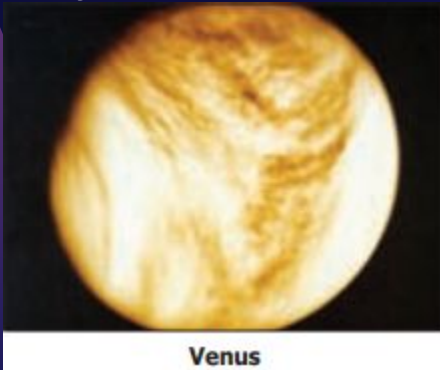
- 8 Planets
- Mercury- no moons, craters, .39 AU from Sun, Messenger Program
- Venus- atmosphere, .7 AU, most visited
- Earth- 19 mi/s, seasons from tilt, 70% water-covered, atmosphere
- Mars- Atmosphere, close to earth day, 2 moons, 1.5 AU



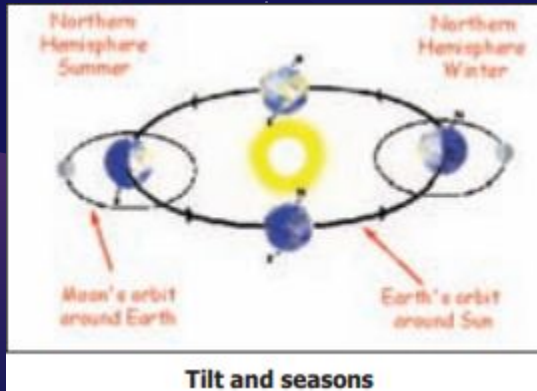
Mars



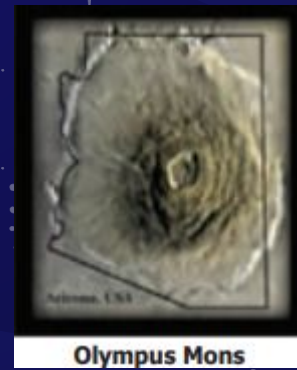
Valles Marineris



Venus



Tilt and seasons



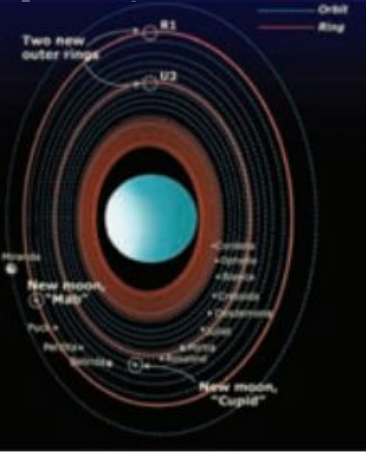
Olympus Mons



Sojourner Truth

Chapter 4: Planets

- Jupiter- 5.2 AU, Gas Giant, Storms & atmosphere, 49+ moons
- Saturn- 9.5 AU, Huge but not dense, 62 moons
- Uranus- 19.18 AU, Gas Giant, 60° tilt, rings
- Neptune- 30 AU, WIND, 13 moons, thin rings
- Pluto- 39 AU, Dwarf Planet, Plutoid, 3 moons



Saturn



Uranus



Jupiter



Saturn



Neptune



Pluto

MODULE 6

Spacecraft



MODULE 6'S CHAPTERS



1. Unmanned Spacecraft

Satellites and aircraft that function like manned vehicles



2. Manned Spacecraft

People in space, Manned projects, Shuttles



LIVING & WORKING IN SPACE

Spacestations, EVAs, functions on the Earth

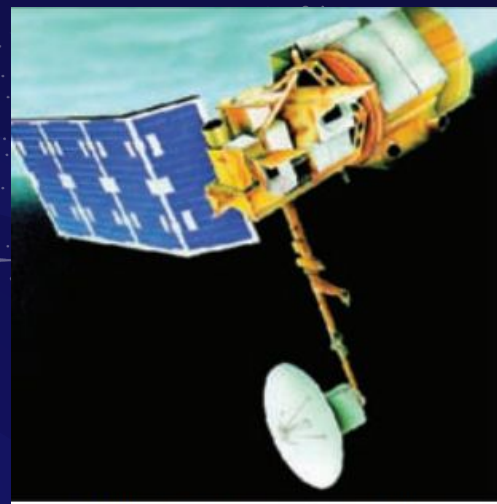


01

Unmanned
SPACECRAFT

Chapter 1: Satellite Types

- Satellite from French meaning guard/attendant
- More than 24,000 satellite launches
- Communications, navigation, Earth observation, weather
- GNSS & GPS
- COMMSAT, LANDSAT, GOES



LANDSAT: a Earth Observing Satellite

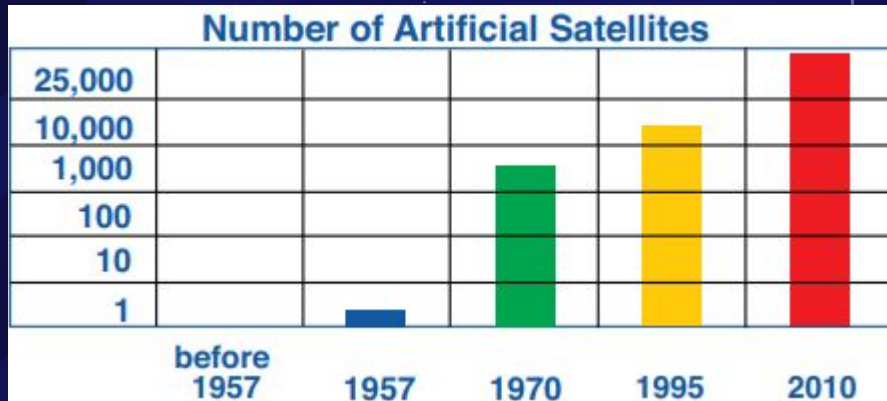
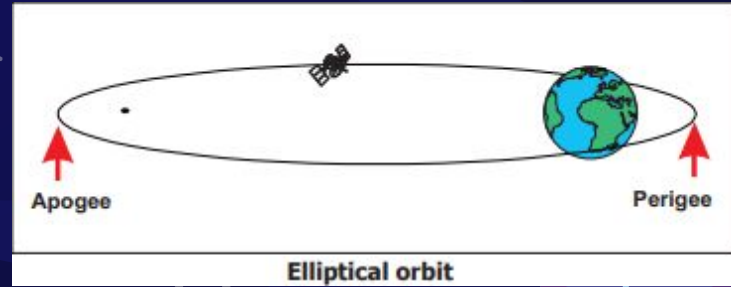
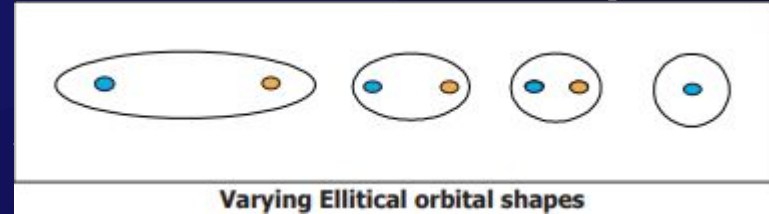
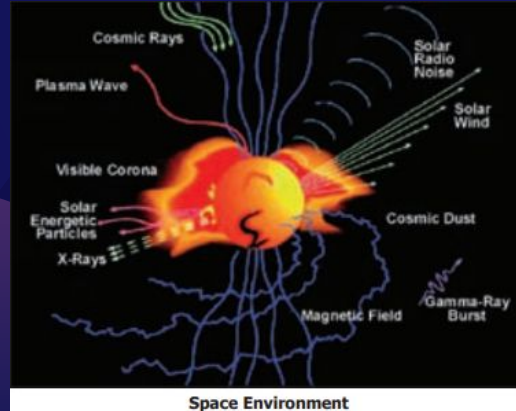
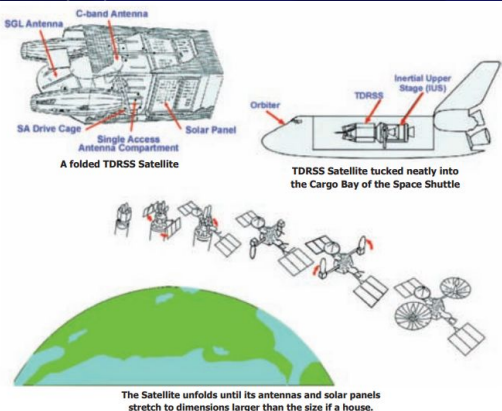
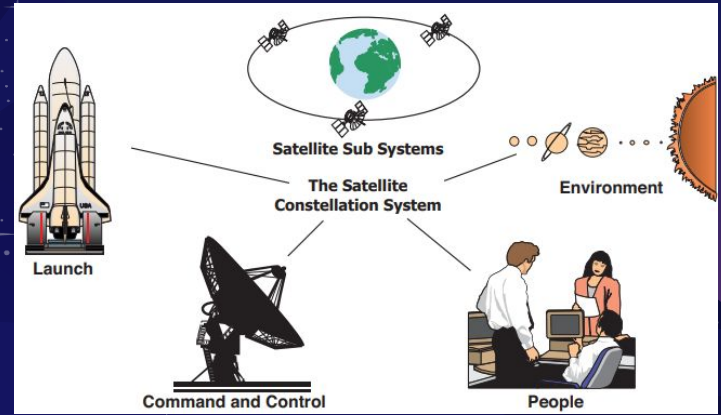


Image of a GPS Satellite on orbit about the Earth

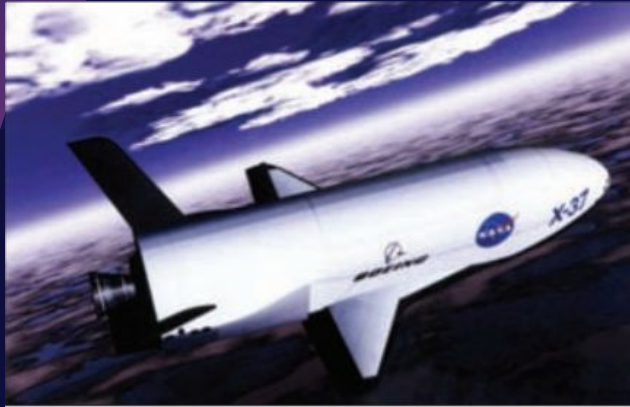
Chapter 1: Satellite Specifics

- Scientific Missions- Explorer series
- Space Probes- Pioneers, Vikings, Voyagers
- System- It's a process
- Orbits; Geocentric, Heliocentric, Kepler's Laws



CHAPTER 1: SPACECRAFT VEHICLE

- Form follows function
- NASA's X-37



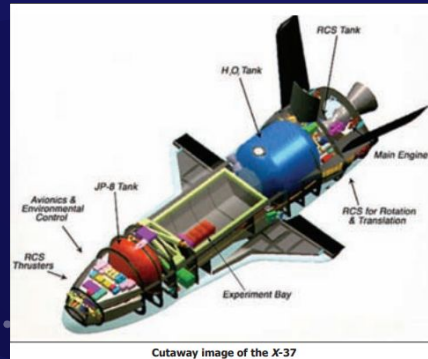
The X-37 Space Plane



Image of the Helios spacecraft: designed to operate in an environment with extremely low temperature, extremely low pressure, and no aerodynamic drag



The Hubble Space Telescope: a space vehicle that needs many subsystems working together to keep it operating for years



Cutaway image of the X-37



The Gray Nurse Shark as an example of "form following function"



The F-16: designed to pass through the air with a very low aerodynamic drag



02

Manned spacecraft

Chapter 2: People in Space

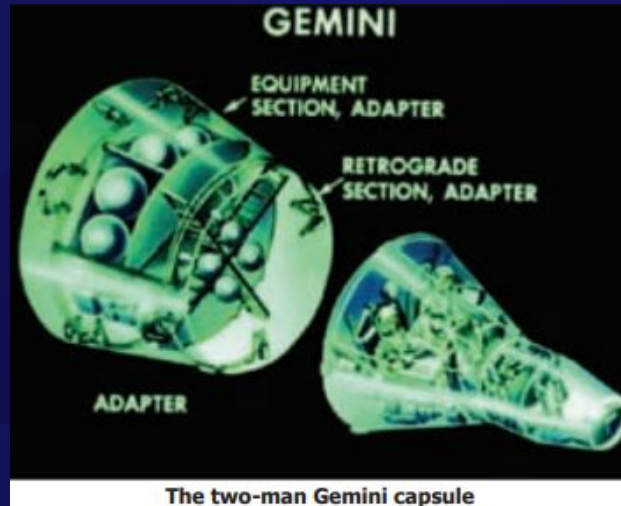
- Russians & Space Race; Yuri Gagarin, Salyuts SS missions
- US Project mercury- John Glenn US first
- Project Gemini- Ed White first US space walk
- Project Apollo to get to moon, made it with Apollo 11



Gemini IV's astronaut Ed White during a 22-minute space walk



Cutaway image of the Mercury capsule



The two-man Gemini capsule



Neil Armstrong, the first human to walk on the Moon

Chapter 2: More Space Projects

- Project Skylab- put lab in space
- Project Apollo-Soyuz- dock 2 spacecraft together
- Space Shuttle- last 30 days in space
- Challenger, Hubble Telescope, STS-78



The Rollout of the Space Shuttle *Challenger* before it's first launch in 1983

	Russia / USSR	United States	China	Total
1961–1970	16	25		41
1971–1980	30	8		38
1981–1990	24	37		61
1991–2000	20	63		83
2001–2010	20	31	3	54
Total Missions	110	164	3	277

**As of August 2010*

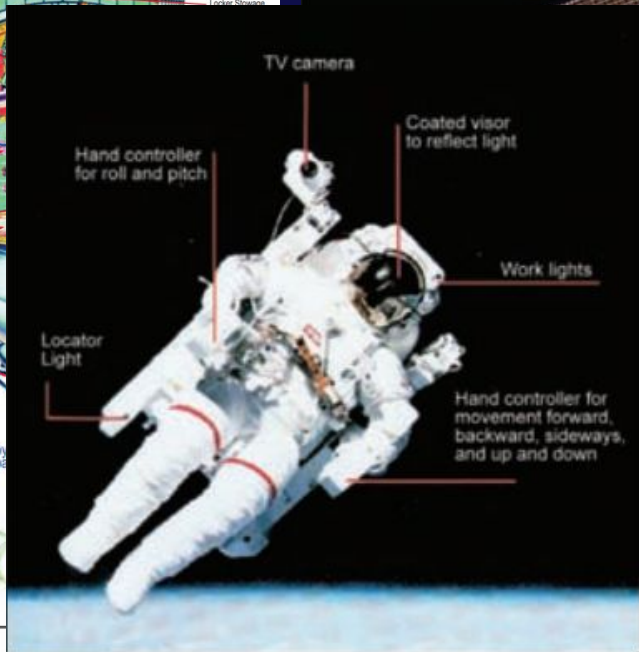
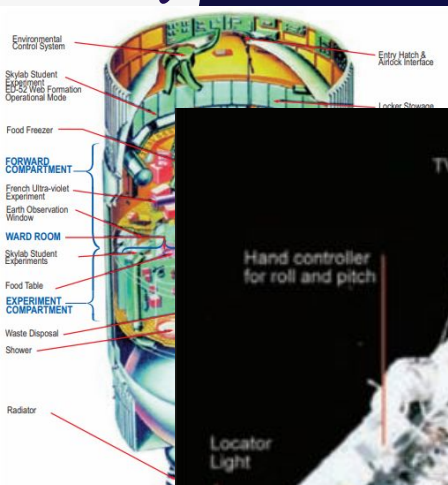


03

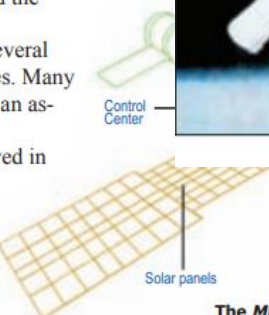
**LIVING & WORKING IN
SPACE**

Chapter 3: Living in Space

- Space Stations necessary
- Russia Salyut Series; Mir
- Skylab & Spacelab
- ISS- regulated air, temp, no gravity, lots of work, exercise
- EVA = Extravehicular Activities = going outside
- Space Suits evolved greatly
- Future- X-37s, Spaceliner, Commercial
- Spinoff Technology



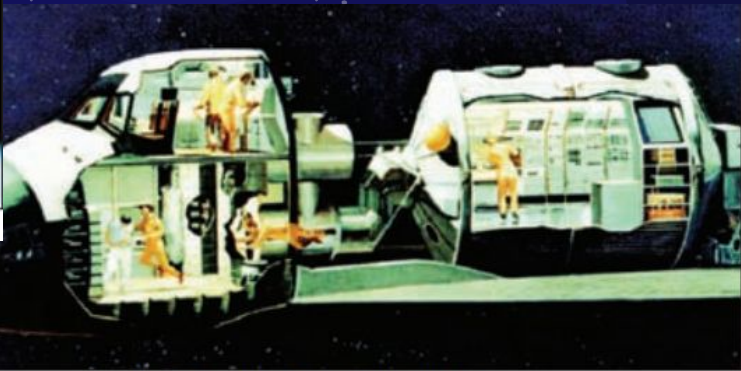
Astronauts
 three weeks.
 months,
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The Manned Maneuvering Unit



The Mir Space Station



Spacelab on board the Space Shuttle Columbia



An EVA near Skylab

MODULE... 7?



The background is a dark blue space scene. It features several white stars of varying sizes scattered across the field. There are several bright purple streaks representing shooting stars or meteors. On the left side, there is a pink planet with a thin purple ring. On the right side, there is a pink crescent moon. The overall aesthetic is clean and modern.

QUESTIONS?

CALCULATE AGE & WEIGHT ON EACH PLANET

	Age	Weight		Age	Weight
Mercury-	x4.15	x0.38	Saturn-	x0.03	x1.08
Venus-	x1.62	x0.91	Uranus-	x0.01	x0.89
Mars-	x0.53	x0.38	Neptune-	x0.006	x1.13
Jupiter-	x0.08	x2.36	Pluto-	x0.004	x0.06
Moon-		x0.17	Sun-		x27.07



THANKS!

Does anyone have any questions?

CREDITS

- ◀ Presentation template by [Slidesgo](#)
- ◀ Icons by [Flaticon](#)
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- ◀ Author introduction slide photo created by Freepik
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- ◀ Big image slide photo created by Freepik.com
- ◀ All images were taken from the Civil Air Patrol Aerospace Modules