# The Evolution of Space Exploration

# Rockets

To overcome the force of Earth's gravity, rockets have to travel at a very high speed. This is called "Escape Velocity." The escape velocity that a rocket must be traveling to escape Earth's gravity is 11.2km/s, which is 6.94miles/second.

**Contrast**

**1.** How do rockets and jet engines get oxygen to burn fuel?

| Rocket | Jet |
|---|---|
| Thrust from exhaust forces the engine forward | |
| carries oxygen as a part of its fuel supply | draws oxygen from surrounding air |

What is the biggest problem scientists have to overcome when launching an object into space?

Force of Earth's gravity

# Satellites

-any small object that orbits a larger object

turday Evening, October 5, 1957 (UP)—Means United Press Price: Five Cents

# Russians Win Race To Launch Earth Satellite

## Man On Threshold Of Space Travel

By DANIEL F. GILMORE
United Press Staff Correspondent

LONDON (UP)—The pulsating radio "beep" of the first manmade earth satellite signalled today to the world that man had crossed the threshold into the age of travel through space.

The Soviet Union announced it had won the race into space by launching an earth satellite Friday, a 184-pound, 22-inch globe now orbiting the earth at 18,000 miles an hour, 560 miles up.

Millions of persons throughout the world heard the "beep...beep... beep..." rebroadcast today by local stations and realized that man had taken his first faltering steps into the new era.

Launching of the satellite was a tremendous victory for science. It was a more tremendous victory for Soviet propaganda to be able to trumpet to the world the Russians were the first to break through the frontiers of space.

**Bolsters ICBM Claims**

— WEATHER —

**WEST VIRGINIA—Partly cloudy with highest in the 60s today and Sunday. Lowest tonight 50 west and 40 east portions.**

**VIRGINIA—Fair with lowest 45 to 50 west and north and 50 to 55 southeast portions tonight, Sunday mostly sunny and a little warmer. Tides on the coast and lower bay will run a foot or two above normal.**

## *How To Spot Satellite*

By UNITED PRESS

Here's how to look for the Russian earth satellite which will be whizzing through the sky at 18,000 miles an hour.

The best time to spot it is at dawn or dusk when the sky is semi-dark. There is a chance that it could be seen if it travels across the face of the moon at night.

The best instruments to use are ordinary binoculars or telescopes. Powerful telescopes won't pick it up because of their narrow fields.

Through optical instruments, the satellite will look like the faintest star which can be seen with the naked eye.

Keep a sharp eye out. The satellite travels so fast it may appear on the horizon for only seconds and chances of spotting it have been estimated at one in a hundred.

## Epic-Making

## U. S. May Speed Up Satellite Program

By JOSEPH L. MYLER
United Press Staff Correspon

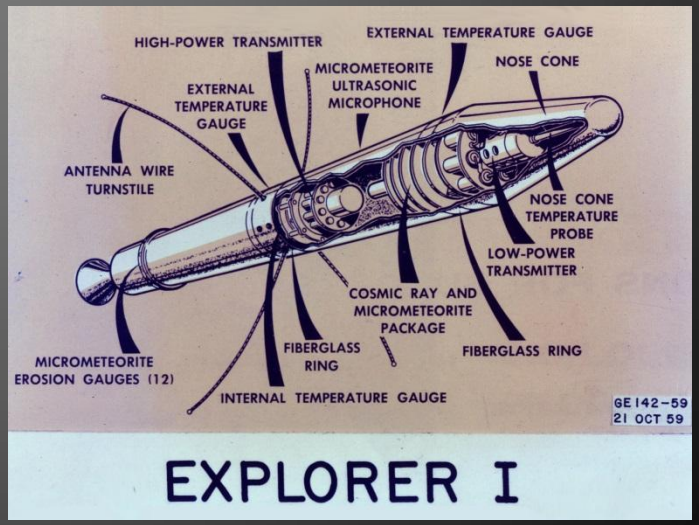
WASHINGTON (UP)—Amer scientists caught flatfooted Russia's epic launching of the man-made moon, indicated the United States may spee its own earth satellite progra

Leaders of the U.S. satellite gram also said that it ap Russia rocketed its heavy pound satellite into a globe dling orbit with a rocket to an intercontinental ba missile.

That could mean Russi only has beaten this country frontiers of space, but also has been called the "ul weapon" for modern day wa ICBM. This country has tested a successful ICBM.

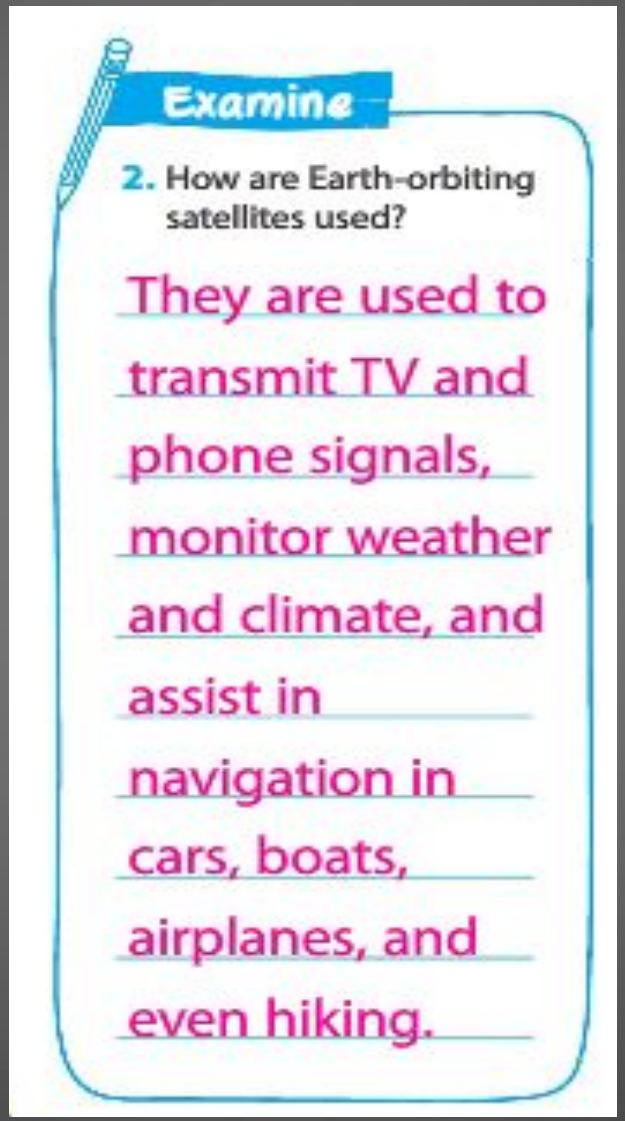
American diplomats co Russia had scored a notable aganda victory. The milita

[Sputnik Launch]




[Explorer 1 Launch] (start @ 2:20)

# Uses of Satellites



# NASA

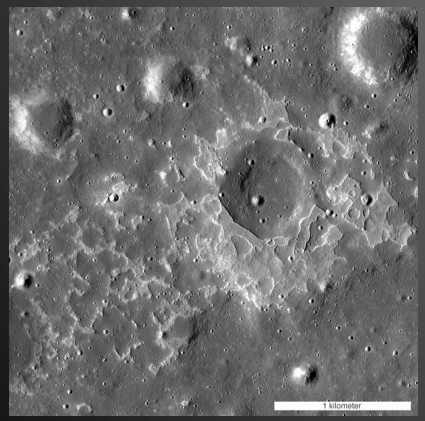
**N**ational **A**eronautics and **S**pace **A**dministration

Established in 1958 by U.S. Congress

Oversees all U.S. space missions and telescopes

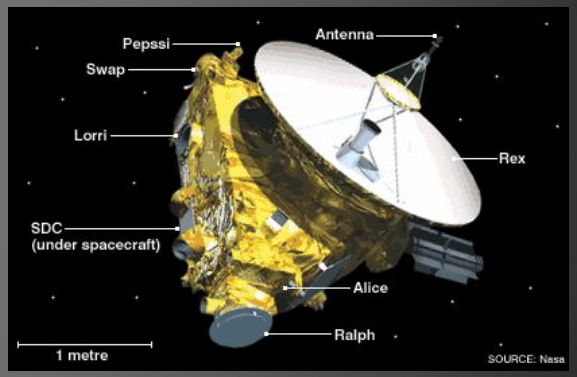
# Space Probes: Orbiters, Landers, Flybys

Orbiters reach their destinations, slow down to be caught in that object's gravity, and continue to orbit that object. Length of time depends on fuel supply. We currently have Lunar Reconnaissance Orbiter (LRO) sending us new information about the moon.




Landers touch down on surfaces by using rockets and parachutes to descend to the surface. Often, rovers are sent out to explore. Curiosity is a Rover currently on Mars's surface.

Flybys do not orbit or land; they flyby and continue out to space eventually leaving the solar system. Voyagers 1 & 2 and New Horizons are flybys.




**Recognize**

**3.** Why do scientists send uncrewed missions to space?

Probes are cheaper to build and can make trips that would be too long or too dangerous for humans.

# How Do You Choose a Landing Site on Mars?

# Human Spaceflight

The first human in space was Russian cosmonaut Yuri Gagarin. (April 12, 1961 )

The first American in space was Alan Shepard. (May 5, 1961)

**Mercury Missions**– the first human spaceflight program of the United States, its goal was to put a man into Earth orbit and return him safely, ideally before the Soviet Union

The seven Mercury astronauts were (from left) Wally Schirra, Alan Shepard, Deke Slayton, Gus Grissom, John Glenn, Gordon Cooper and Scott Carpenter.

**Gemini Missions**– the objective was to develop space travel techniques to support Apollo's mission to land astronauts on the Moon; nicknamed "Bridge to the Moon"

# Apollo Missions

In 1961, John F. Kennedy challenged Americans to send astronauts to the moon by 1970.


His speech


**Apollo 1** - Never launched. On 27 January 1967, a fire erupted in the Apollo command module during a test on the launch pad, destroying the module and killing the astronauts.
**Apollo 17** - A geologist was the first professional scientist to go on a NASA mission.
**Apollo 7** – First Apollo mission in Earth orbit
**Apollo 8 –** First lunar orbit
**Apollo 16** – more science exploration; new Area; several EVAs
**Apollo 9** – First test of manned lunar module
**Apollo 15** – first lunar rover, geology experiments
**Apollo 10 –** Tested the lunar lander; "dress rehearsal" for the actual landing
**Apollo 12** – Recover debris left from Surveyor probe
**Apollo 14** – to perform detailed exploration; Alan Shepard plays golf
**Apollo 13** – "The Successful Failure"
**Apollo 11** – Landed on the moon
Click here for more info.


APOLLO 11
OFFICIAL TRAILER

# Launch and Splashdown

# Remembering Apollo 1

January 27, 1967

https://www.nasa.gov/specials/dor2019/

# Space Shuttles

**In 1981 NASA launched a new, reusable spacecraft to transport people to and from space.**



Columbia's first landing
start @ 3:00

**The Space Shuttle fleet consisted of five shuttles:**
***Challenger, Columbia, Atlantis, Discovery, and Endeavor.***

**(The Space Shuttle *Enterprise* was primarily a test shuttle.)**

# Remembering the Challenger Crew

## January 28, 1986

**The next Shuttle launch was not until September 1988.**

https://www.nasa.gov/specials/dor2019/

# Remembering the Columbia Crew

## February 1, 2003


**The next Shuttle launch was not until July 2005.**

https://www.nasa.gov/specials/dor2019/

# Space Shuttles

NASA retired its three remaining space shuttles in 2011 to make way for a new space exploration program aimed at sending astronauts to asteroids and other deep space targets.

On July 8, 2011, *Atlantis'* launched on its 12-day mission to deliver vital spare parts to the space station to help keep the orbiting lab going after the shuttle era ends. It was NASA's 135th shuttle mission since the program began 30 years before. *Discovery* and *Endeavor* had already flown their last missions in February and May of 2011.

Endeavor retires:
click *here* for video

# ISS

The United States and fifteen other countries cooperated in building the International Space Station.  It is a research laboratory in constant orbit around Earth.  The research and experiments conducted on ISS will benefit the planning of future space missions.

NASA updates on ISS

# Soyuz Landing Animation


https://youtu.be/ueA6fNx2SOo

# Actual Soyuz Landing

https://youtu.be/PoOapNYUNL0

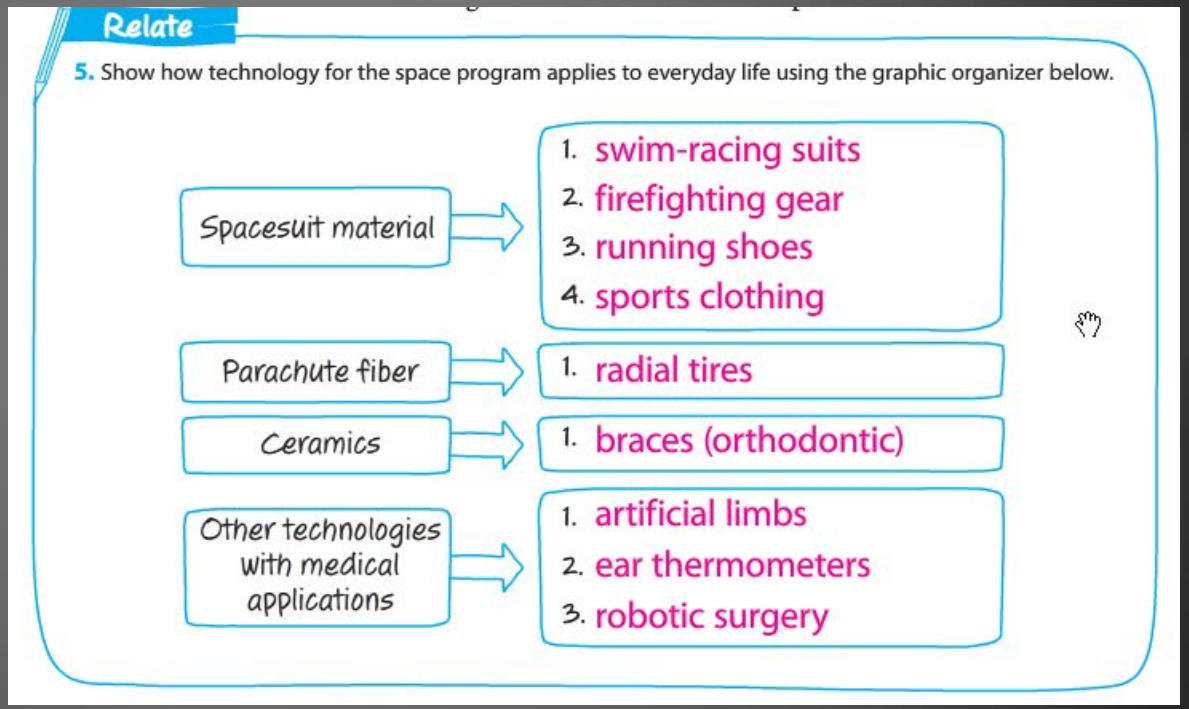
Website:
https://www.howmanypeopleareinspacerightnow.com/

# Space Technology

The rockets, shuttles, and space gear that astronauts wear must be able to withstand the extreme temperatures and pressure of outer space.

-suits to protect from extreme temperatures and loss of air pressure
-flexible, strong

-parachute cords strong enough to land spacecrafts on the moon



# Space X

**“SpaceX designs, manufactures and launches advanced rockets and spacecraft. The company was founded in 2002 to revolutionize space technology, with the ultimate goal of enabling people to live on other planets.**

Elon Reeve Musk is a South African-born Canadian American business magnate, investor, engineer and inventor. He is the founder, CEO, and lead designer of SpaceX; co-founder, CEO, and product architect of Tesla, Inc.

- **<u>Advancing the Future</u>**
- flying numerous cargo resupply missions to the International Space Station.
- Dragon (manned capsule) carries astronauts to space.
- Some contracts include commercial satellite launches as well as NASA and other US Government missions.
- Currently under development is the Falcon Heavy, which will be the world’s most powerful rocket. All the while, SpaceX continues to work toward one of its key goals—developing fully and rapidly reusable rockets, a feat that will transform space exploration by delivering highly reliable vehicles at radically reduced costs.” - http://www.spacex.com/about

# 14 things you might not know about the SpaceX rocket launch

If you missed the launch or just wondered why there's a car in space, we have all the answers.

BY **PATRICK HOLLAND** / FEBRUARY 9, 2018 3:10 PM PST

One of the most ridiculous parts of the launch was seeing a dummy astronaut called "The Starman" inside a Tesla Roadster floating in space.

SpaceX

Click *here* for article and video.

# Space X
# First Successful Launch/Landing of Rocket

December 21, 2015

It marked the first time a large rocket has delivered spacecraft to orbit and returned to Earth intact, so that it could potentially fly again.


The 230-foot Falcon 9 blasted off from Launch Complex 40 at 8:29 p.m. ET, rumbling aloft with 1.5 million pounds of thrust and carrying 11 commercial satellites to begin its return to flight after a June 28 launch failure.

About two-and-a-half minutes later, the 14-story first stage dropped away and began the first of three engine burns sending it back toward a concrete pad at SpaceX's "Landing Complex 1" at the Cape.

Fast forward through middle portion (click here)

# “Starman”

Click *here* for latest news; scroll down to “highlight reel.”

## Milestones

Circle the calendar for these events, which Pearson has flagged on his website:

— Close approach to Mars, on June 8, 2018, at a distance of 0.740 AU.

— Most distant point from the sun, on Oct. 10, 2018, at a distance of 1.655 AU.

— Far point from Earth, on Feb. 21, 2019, at a distance of 2.446 AU.

— Close approach to the sun, on Aug. 9, 2019, at a distance of 0.983 AU.

— Close approach to Mars, on Sept. 16, 2019, at a distance of 0.649 AU.

— Far point from Earth, on Jan. 15, 2020, at a distance of 2.336 AU.

— Far point from the sun, on April 20, 2020, at a distance of 1.656 AU.

— Close approach to Mars, on Oct. 6, 2020, at a distance of 0.049 AU.

**https://www.whereisroadster.com/charts/**