



# Introduction Presenter & ULA



- ❑ Presenter Introduction
- ❑ United Launch Alliance (ULA)
  - A company that launches rockets!
  - 50 years of experience in launching rockets
  - The largest rocket expertise IN THE WORLD
  - We launch satellites into space, not people

**The Atlas Family**



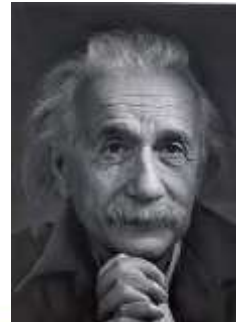
**The Delta Family**



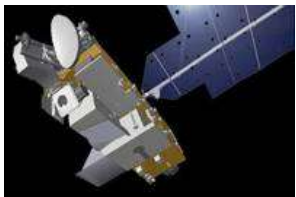
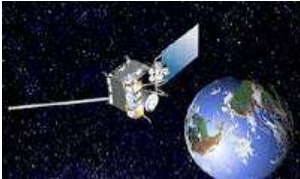
# Importance of Math and Science



| *Newton* | *Curie* | *Einstein* |



# Why Do We Need Satellites?

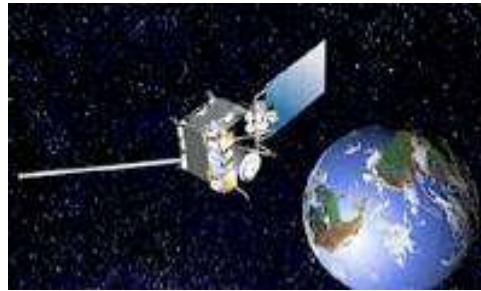


- ❑ Weather information
- ❑ Mapping
- ❑ Communications
- ❑ Earth and planetary observation
- ❑ Astronomy
- ❑ National security





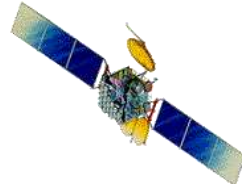
# How Do Cell Phones Work?



# How Heavy are Satellites?



Block IIR GPS: ~4,500 lbs.



ICO: ~6,100 lbs.



Milstar: ~10,500 lbs.



Mercedes S-Class: ~4,500 lbs.



Humvee: ~5,900 lbs.



School Bus: ~23,000 lbs.



Delta II



Atlas V & Delta IV



Delta IV Heavy

# How Tall and Heavy is a Rocket?

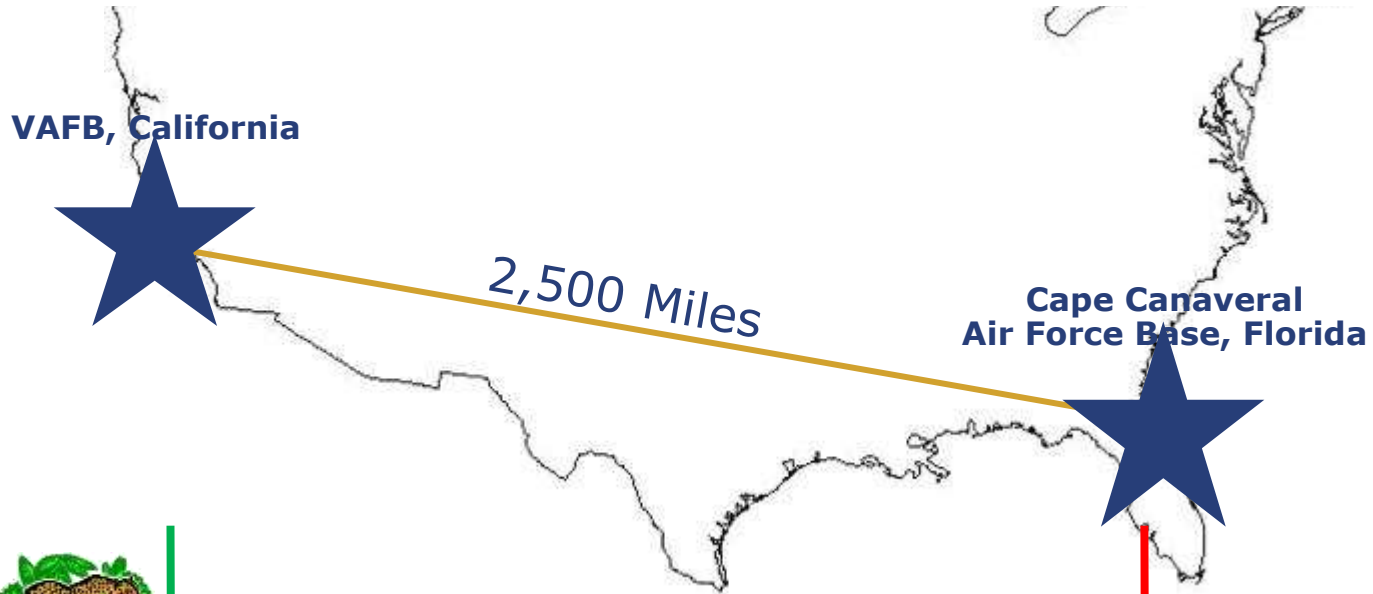


Atlas V Rocket = 200 feet high  
= 45, 4<sup>th</sup> Graders

Atlas V Rocket = 1.5 million pounds  
= 68 School Buses



# How Fast is a Rocket?



*Cheetah*  
**60 mph**



*Formula 1 Race Car*  
**250 mph!**



*Fighter Jet*  
**1000 mph!!**



*Atlas V*  
**35,800 mph**



Start

Finish

41 Hours

10 Hours

2½ Hours

4 Min 11 Sec

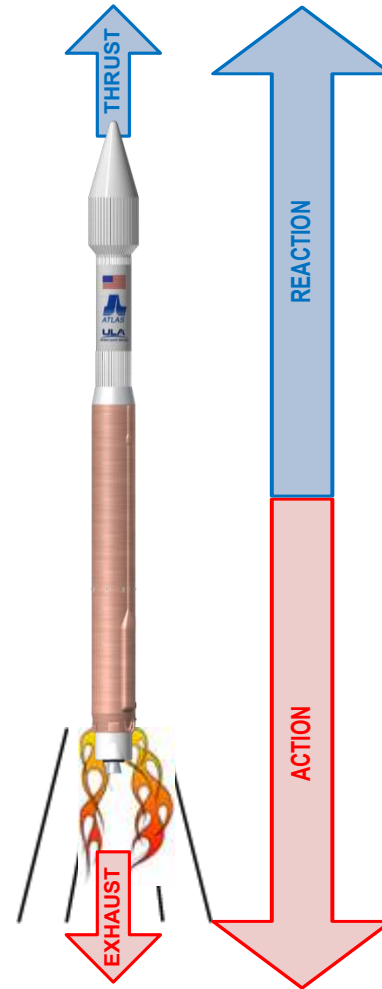
The Math:  $D = vt$



# Newton's 3<sup>rd</sup> Law of Motion



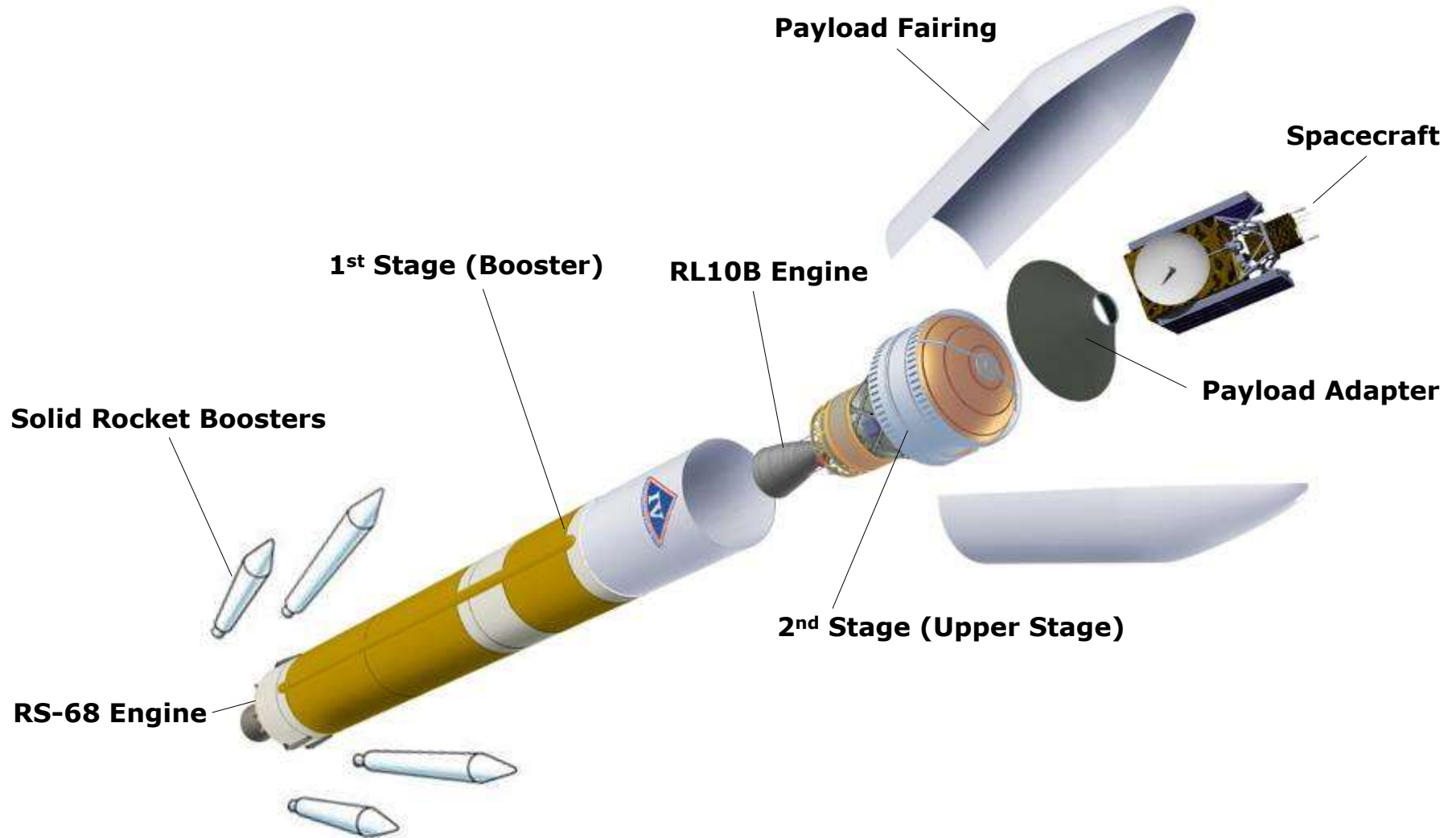
- “For every **action**, there is an equal and opposite **reaction**”



The Math: Thrust =  $m_{\text{flow}} V_e + (p_e - P_0) A_e$

# Parts of a Rocket

## Delta IV Launch Vehicle



## Launching a Rocket



# Math, Science and Space



- ❑ Who Would Like to Design Rockets?
- ❑ Who Can Be an Engineer/Scientist?
  - Curious About How Things Work
  - Technology is Fun
  - Like Math and Science
  - Enjoys Working as a Team







# Delta Mariner



# Antonov



The Antonov transports vehicle hardware from Decatur, Alabama to the launch sites

