

Middle School Lesson Plan

Launching History: Goddard's First Flight and the Origins of Rocketry

Student Handout



Mission Brief

1. What do you think makes someone a "rocket pioneer"?
2. Have you ever been doubted when you had a great idea? How did it feel?
3. What do you already know about rockets and how they work?

About Robert Goddard

Write 3 facts about Robert Goddard that might be relevant for the Mission Briefing.

- 1.
- 2.
- 3.

Station 1: Goddard's Notebook - Decoding Innovation

Observation Notes

What do you notice about Goddard's drawings and handwriting?

Technical Translation Challenge

Read this excerpt: *"It rose 41 feet & went 184 feet, in 2.5 secs., after the lower half of the nozzle burned off."*

1. What do you think "nozzle" means in a rocket?

2. What problem was Goddard trying to solve when the nozzle burned off?
3. How might this relate to modern rocket engines staying cool?
4. Why do you think he kept such detailed notes (exact feet, exact seconds)?

Past vs. Present

List 3 similarities between Goddard's sketches and modern rocket diagrams:

- 1.
- 2.
- 3.

Imagine the Future

If Goddard could see SpaceX or Artemis missions today, what would surprise him most?

Goddard kept detailed notebooks for over 40 years. Why do you think record-keeping is important for scientists and engineers?

Station 2: Liquid Fuel Mystery - The Breakthrough Experiment

Solid Fuel Observations

Once you light solid fuel, can you control how fast it burns?

Yes No

Can you turn it on and off like a switch?

Yes No

Liquid Fuel Experiment Results

Dropper Challenge:

- I released exactly 5 drops: Success Need practice
- I started and stopped the flow 3 times: Success Need practice
- I controlled the speed of drops: Success Need practice

Compare and Contrast

Which gives you more control: solid fuel or liquid fuel?

Why would control be important for a rocket?

Modern Rockets

1. What is the biggest difference between solid and liquid fuel when it comes to safety? Use specific examples.
2. The Space Shuttle used BOTH solid boosters and liquid engines. Why did NASA need both types instead of using just one?
3. How does controlling the dropper demonstrate the advantage of liquid fuel over solid fuel rockets?

The Big Question

Why was liquid fuel Goddard's greatest breakthrough?

Station 3: Public Reaction Booth - Innovation vs. Skepticism

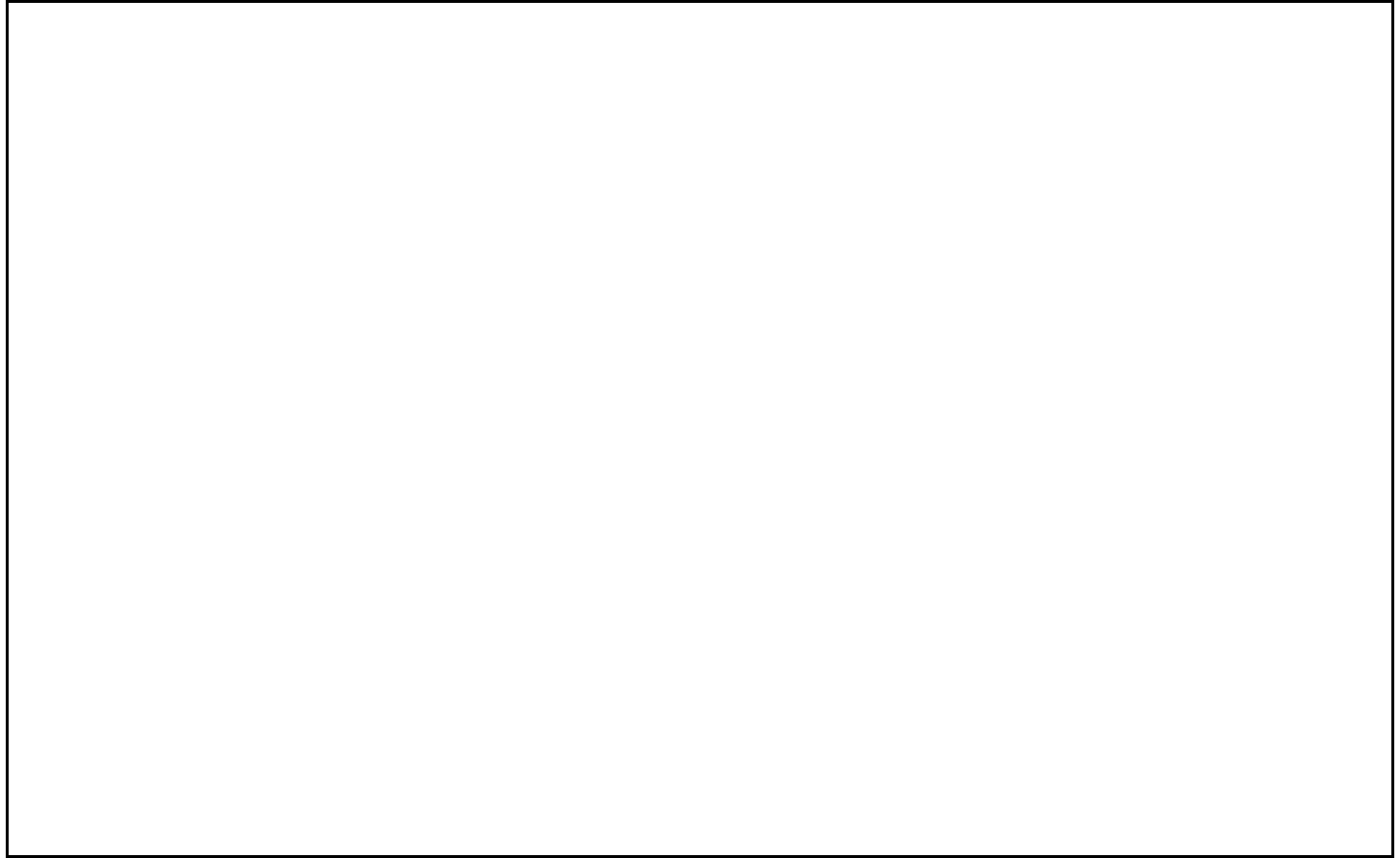
Historical Quotes Reaction

After reading the newspaper clippings, how do you think Goddard felt?

Writing Challenge (Choose Option A or B)

I chose: Option A: Letter to the Editor Option B: Goddard's Response

My letter:



Modern Connections

Think about these once-doubted innovations:

- Electric cars (Tesla)
- Smartphones (iPhone)
- Reusable rockets (SpaceX)

Why do people resist new ideas?

Persistence Discussion

How did Goddard's persistence change history?

Station 4: The Moon Mission Map - From Goddard to Apollo and Beyond

Timeline Activity

Number these events in the correct order (1-6):

- ___ Goddard's first liquid rocket flies 41 feet
- ___ Apollo 11 lands on the Moon
- ___ Sputnik becomes first satellite in space

- ___ German V-2 rocket is developed
- ___ Space Shuttle program begins
- ___ Artemis program & modern Mars missions

Matching Challenge

Draw lines to match Goddard's inventions to missions that used them:

Inventions:

- Liquid fuel engines
- Gyroscopic guidance systems
- Multi-stage rockets

Missions:

- Saturn V Moon rocket
- Space Shuttle
- SpaceX Falcon 9

Calculate the Legacy

1. How many years between Goddard's first rocket (1926) and the Moon landing (1969)?
 - a. Answer: _____ years
2. How did Goddard's work make the Moon landing possible?

Future Connection

How does Goddard's work from 100 years ago still matter for today's Artemis missions?

Rocket Challenge

Patent Design

Complete a one-paragraph design summary including:

- Rocket name
- Key features (fins, nose cone, weight)
- How it will achieve stability and distance
- Predicted performance

Your rocket must include:

1. A guidance system (fins for stability)
2. A body/fuselage (main structure)
3. A nose cone (for aerodynamics)
4. A propulsion method (how it will launch)

Engineering Constraints:

- Must travel at least 5 feet
- Must use only provided materials
- Must demonstrate a "safe landing" (not break on impact)

- Must be drawn and described in your patent application

Patent Application	
Rocket Name	
Key Features	
How Rocket will Achieve Stability and Distance	
Predicted Performance	
Detailed Drawing (labeled)	

Rocket Design Debrief Questions

1. What challenges did you face in your design? How did you solve them?

2. How did testing help you improve your rocket?

3. How does this relate to Goddard's experimental process?

Big Picture Reflection:

4. How was Goddard ahead of his time?

5. How do his ideas still show up in modern rockets?

6. What role did curiosity, failure, and experimentation play in his work?

Career Connection: What aerospace careers involve this kind of design work?