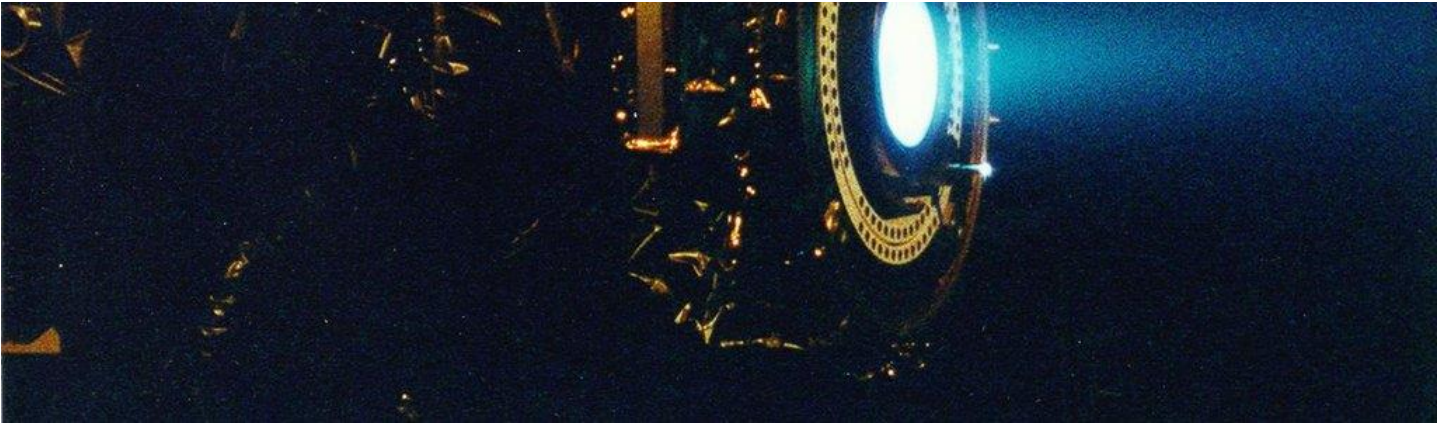


# Breakthrough

- Details



## The Challenge

Faster-than-light travel is the key to humanity's dreams of inter-galactic space travel. Your challenge is to create an app, tool, game, or other interactive application that showcases both existing, as well as next generation/theoretical, breakthrough spacecraft propulsion in an engaging way.

## Background:

The science fiction realm is one of the most fascinating and (lucky for us) is growing ever closer to reality. The world is full of people who believe that anything is possible through science. A problem only needs to be presented, and humans will figure it out!

Faster travel is the key to dreams of interstellar space travel. The ability to leave our solar system and learn about our gigantic Milky Way galaxy and beyond is one of the most fascinating ideas, but the vastness of space and the speed at which we can travel currently prevents us from doing this.

Breakthrough propulsion is an area of technology development that seeks to explore and develop a deeper understanding of the nature of space-time, gravitation, inertial frames, quantum vacuum, and other fundamental physical phenomena, with the overall objective of developing advanced propulsion applications and systems that will revolutionize how humans explore space.

**Your challenge is to create an app, tool, game, or other interactive application that showcases both existing, as well as next generation/theoretical, breakthrough spacecraft propulsion in an engaging way.** The underlying goal is to create awareness of

new propulsion technologies that are being released and currently exist, and more importantly, to create awareness of the need for “breakthrough propulsion.”

### **Potential Considerations:**

- You may (but are not required to) decide to create a game or app in which the user assembles 3D models of theoretical propulsion engines, attaches them to spacecraft, and flies them through space. Your solution could be (but is not required to be) a video game, Augmented Reality, or Virtual Reality.
- Other activities may (but are not required to) include the evaluation of travel distances and durations with current technology to well-known locations in and out of the solar system. Can you add some imaginary places based on science data? Can you have separate categories to showcase current new technology and theoretical technology? You may include sub categories, such as air propulsion, water propulsion and space propulsion.
- Another approach may be to have every player start with current rocket technology and fly through space, earning upgrades along the way for performing tasks, such as answering science trivia questions or saving planets from asteroids. Each upgrade could come with a piece of a higher propulsion type and an explanation of how it works. Players could upgrade all the way to the fastest propulsion type, the warp drive. This is merely one game concept provided as an example; you are not required to pursue it.
- Some exciting propulsion types include nuclear propulsion, solar sails, ion engines, and warp drives.
- Some goals to think about: How can you inspire younger users to pursue very difficult career fields and more quickly advance the development of new space propulsion systems? How can you communicate the vastness of space to people and provide education on how different propulsion systems work? Can you do this in a way that is fun to use?
- Other activities may (but are not required to) include:
  - incorporating a well-known rocket engine to be used as a baseline of understanding and as a comparison
  - including different propulsion types; a well-known rocket engine, nuclear propulsion, solar sails, ion engines and warp drives
  - providing an explanation on how each propulsion type works. (This could simply be through a written text box, or it could be as complicated as assembling the major parts of an engine)
  - including the comparison of travel times to well-known destinations in the universe
  - providing the ability to watch the spaceship fly or be able to actually pilot the ship

- For the sake of time and simplicity, you may omit calculations for exiting the Earth's gravity and landing on another planet. Assume a starting position of Earth orbit and an ending position of the orbit of another celestial body.

### **Bonus Points:**

- Can you animate what it would look like (from the cockpit) to travel through space at each different speed, and/or design a heads-up display for the spaceship cockpit with speed, estimated time of arrival, and anything else you want to include?
- What interesting destinations newly discovered by NASA can you add?
- Is there a creative way you might animate the "invisible" effects of the selected propulsion? For example, what would the warping of space-time look like?
- Can you add some fun interactive elements, like dodging asteroids, or meeting aliens on the way to your destination?

**For data and resources related to this challenge, refer to the Resources tab at the top of the page.**

*NASA does not endorse any non-U.S. Government entity and is not responsible for information contained on non-U.S. Government websites.*

## **• Resources**

### **EXAMPLE RESOURCES**

- [NASA's Eyes - a free downloadable computer program](#)
- [The Planetary Data System](#)
- [https://imagine.gsfc.nasa.gov/features/cosmic/nearest\\_star\\_info.html](https://imagine.gsfc.nasa.gov/features/cosmic/nearest_star_info.html)
- <https://ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20140000851.pdf>