

A composite image of space. The top half shows the dark side of Earth with city lights and the horizon. The bottom half shows the Earth's surface with clouds and landmasses. The Moon is visible in the upper right corner. The background is filled with stars.

INTERSTELLAR PROPULSION

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HONR 289V – Section 0101

WHERE TO GO?

How to Look:

- Create new satellites
- Search for exoplanets
- Identify planets in the habitable zone



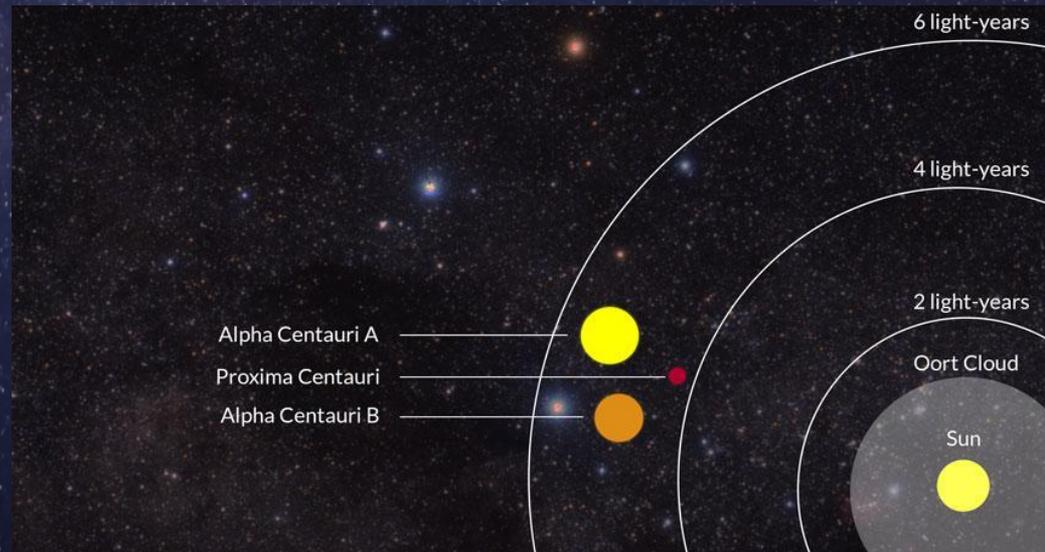
Destinations:

- Alpha Centauri system
- Proxima b

HOW TO GET THERE?

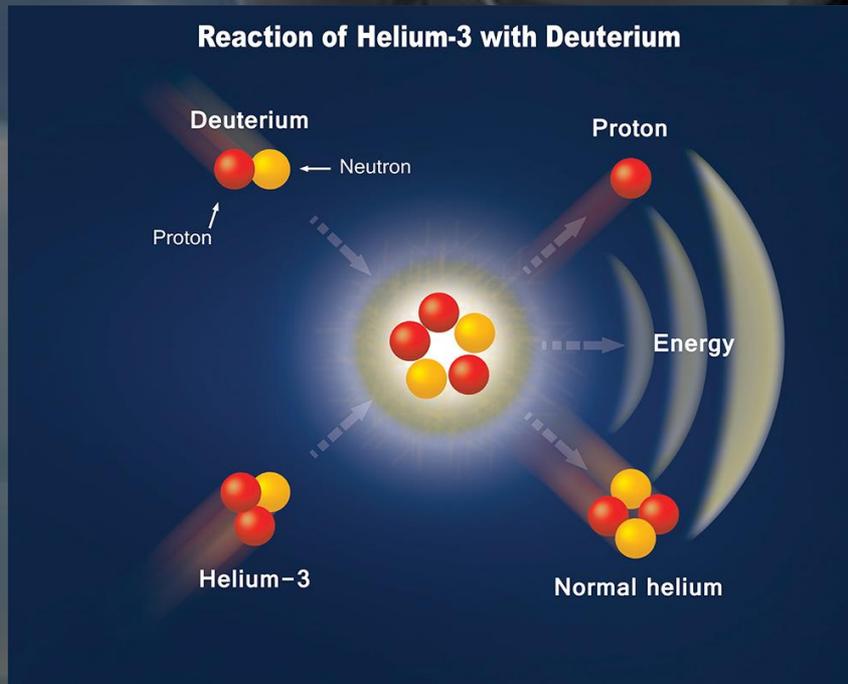
Methods of Propulsion:

- Fusion Rockets
- Laser Sails
- Antimatter Rockets

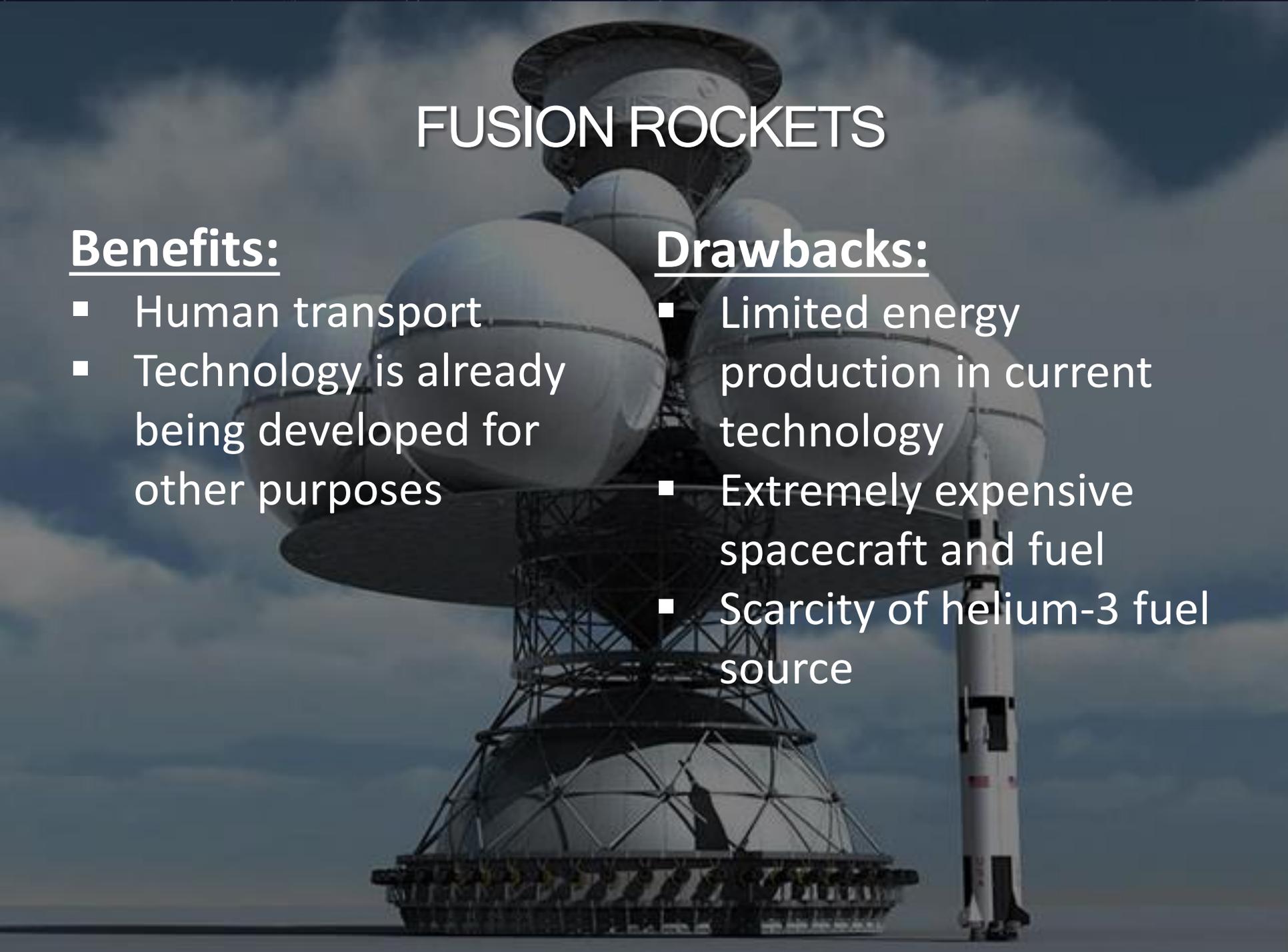


FUSION ROCKETS

- Produce energy from deuterium/helium-3 reaction
- 12% speed of light
- Travel to nearest star in 36 years



FUSION ROCKETS



Benefits:

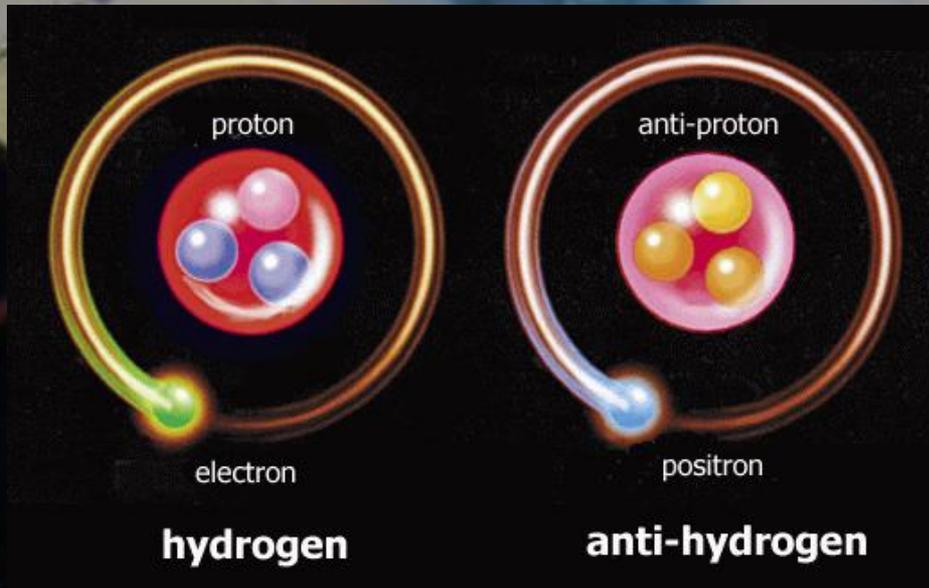
- Human transport
- Technology is already being developed for other purposes

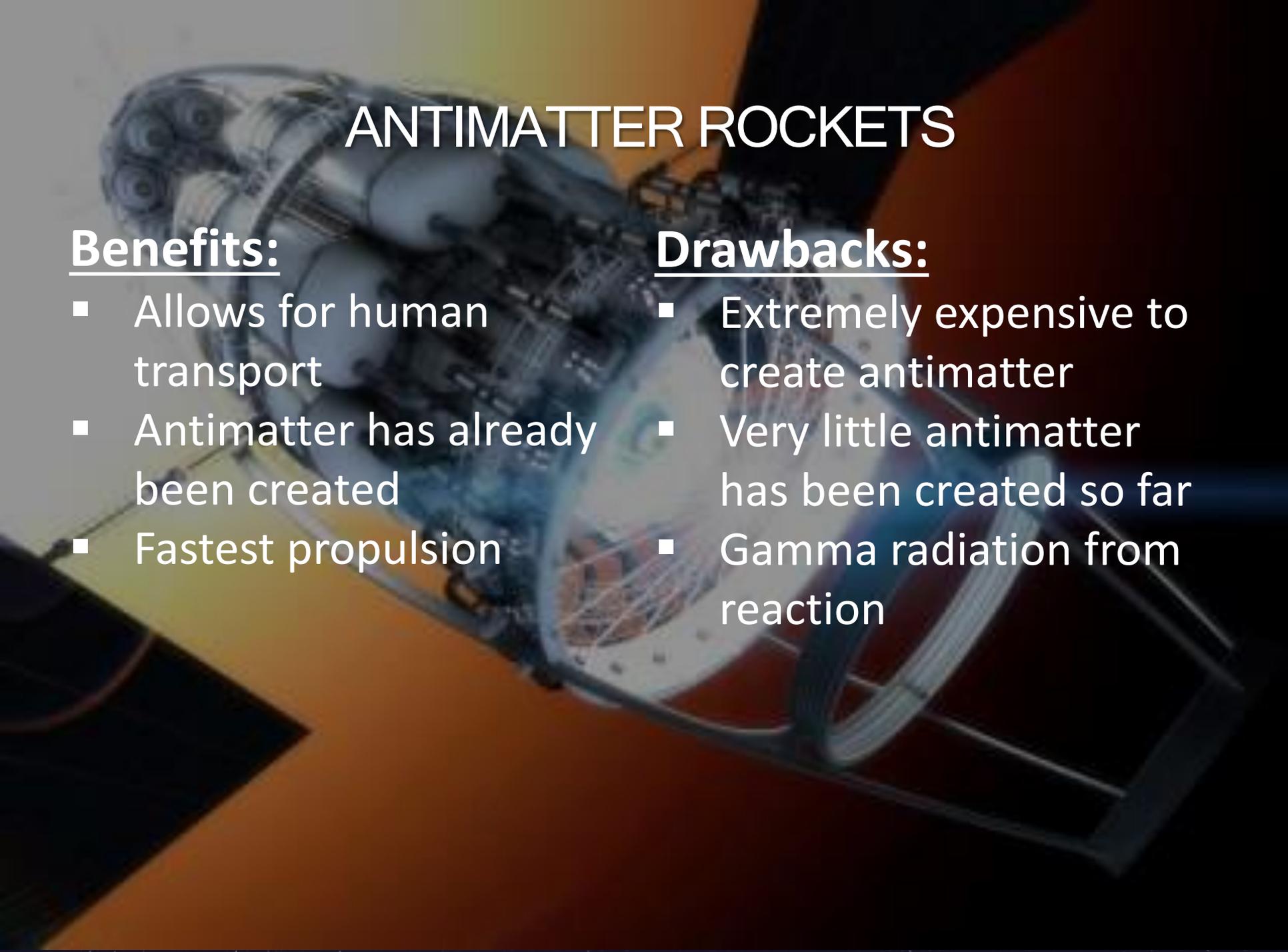
Drawbacks:

- Limited energy production in current technology
- Extremely expensive spacecraft and fuel
- Scarcity of helium-3 fuel source

ANTIMATTER ROCKETS

- Produce energy from reaction between antimatter and matter
- 50% speed of light
- Travel to nearest star in 8 years





ANTIMATTER ROCKETS

Benefits:

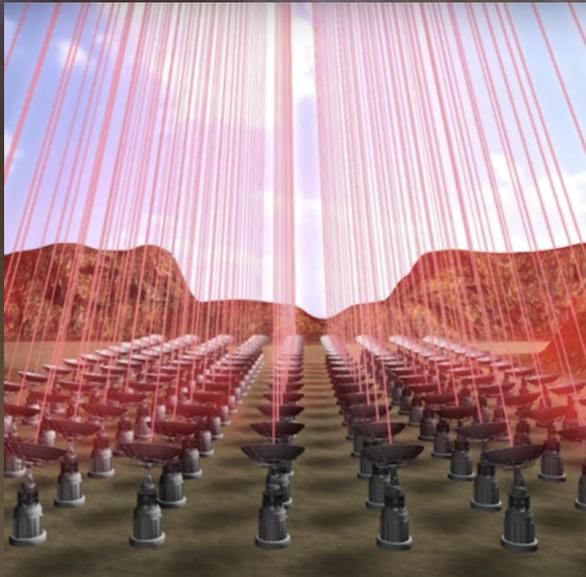
- Allows for human transport
- Antimatter has already been created
- Fastest propulsion

Drawbacks:

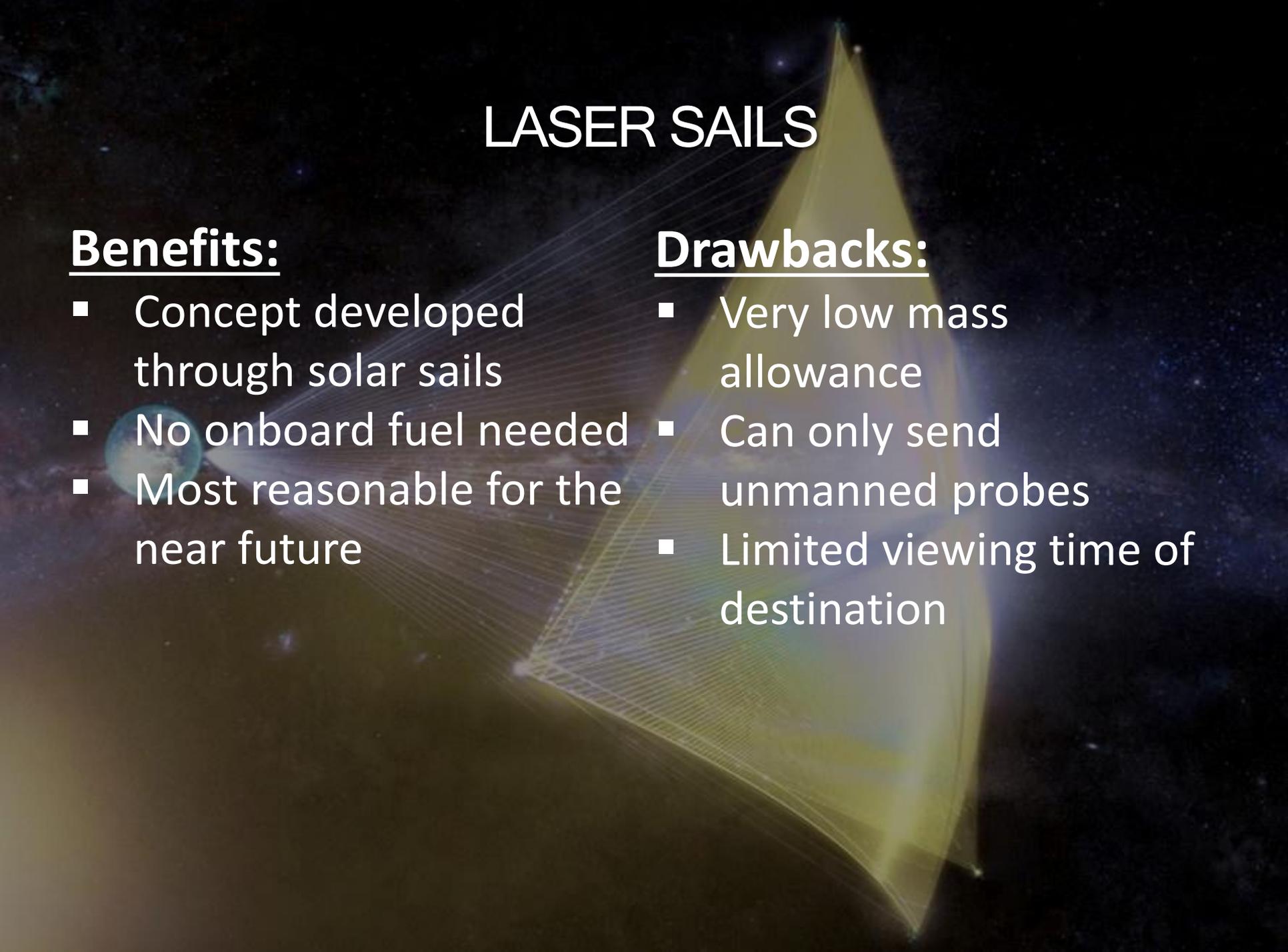
- Extremely expensive to create antimatter
- Very little antimatter has been created so far
- Gamma radiation from reaction

LASER SAILS

- Propulsion generated from mirrors reflecting laser beams
- Laser beams generated on Earth
- 20% speed of light
- Travel to nearest star in 20 years



LASER SAILS



Benefits:

- Concept developed through solar sails
- No onboard fuel needed
- Most reasonable for the near future

Drawbacks:

- Very low mass allowance
- Can only send unmanned probes
- Limited viewing time of destination

FUTURE OF INTERSTELLAR TRAVEL

- Unmanned Exploration
 - Use of laser sails to send small probes
 - Better data to find best destination
- Propulsion Development
 - Advances in fusion and antimatter technology
 - New propulsion methods
 - Eventual human missions



REFERENCES

- Bonsor, K. (2018, June 28). How Antimatter Spacecraft Will Work. Retrieved May 12, 2019, from <https://science.howstuffworks.com/antimatter2.htm>
- Duffy, A. (2016, April 13). Space lasers and light sails: The tech behind Breakthrough Starshot. Retrieved May 12, 2019, from <https://cosmosmagazine.com/space/space-lasers-and-light-sails-tech-behind-breakthrough-starshot>
- Glaser, L. B. (2019, March 26). The hunt is on for closest Earth-like planets. Retrieved May 12, 2019, from <https://phys.org/news/2019-03-closest-earth-like-planets.html>
- Howell, E. (2018, March 30). Exoplanets: Worlds Beyond Our Solar System. Retrieved May 12, 2019, from <https://www.space.com/17738-exoplanets.html>
- Masetti, M., & Mukai, K. (2016, February 4). The Cosmic Distance Scale. Retrieved May 12, 2019, from https://imagine.gsfc.nasa.gov/features/cosmic/nearest_star_info.html
- Williams, M. (2019, April 29). How Long Would It Take To Travel To The Nearest Star? Retrieved May 12, 2019, from <https://www.universetoday.com/15403/how-long-would-it-take-to-travel-to-the-nearest-star/>