Final Report

“Deep Space Travel.”

Team # 51

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**Executive summary**

Our project is about the feasibility of space travel to distant planets that can support human life. We think it is important to colonize other planets because Earth will not be able to support humans indefinitely in the future because of the over use of resources and over populating. We need to find a planet or planets that could sustain our population needs for the human race to survive.

 Earth is very special place because it has the conditions to support life. As of now there are no other planets in our solar system that can support human life. Therefore we have to build colonies or travel to exoplanets beyond our solar system. Exoplanets are planets that orbit other suns. We believe that domed colonies don’t have the scale to support our species, so another entire planet is needed.

We haven’t always known about exoplanets because we didn’t have the telescopes needed to look that far. Now we have the technology to see them. Not all exoplanets can be inhabited by humans. Most of the planets don’t have the right properties to create or support life. The planet also needs to be in the “Goldilocks Zone” for their sun. The “Goldilocks Zone” is the right distance away from the sun for life to thrive because it has the right temperatures.

We know statistically many to most distant stars have planets around them. Therefore some of the planets have a high possibility of being inhabitable. We think that it is important to someday leave Earth and go to another planets to explore it physically after astronomers identify the most likely candidates. For now we are using a planet called around Proxima Centauri B that orbits around a sun called Proxima Centauri. The planet is 4.24 light years from earth. This gives us a starting distance.

We have found 4 possible ways to get to the planets, they are: 1) Chemically fueled 2) Solar sails 3) Laser sails 4) Nuclear blasts

 We developed a NetLogo program that represents and simulates the different types of space crafts and comparing them to see which vessel is a more efficient and viable way of going into deep space.

**Problem statement**

This project is about finding the most efficient way of deep space travel with different types of space craft with different means of propulsion. Our team was interested in space after we saw the, movie “Guardians of the Galaxy”. We were fascinated by how the characters could get to a planet quickly and the fact that there could be civilizations on different planets. This got us to start researching more about space and space travel.

The main reasons for space traveling are to explore or to colonizing. Out of those we picked colonization because it is important that humans leave earth at some point. We felt it was more interesting and we found a lot of information on the topic. Also, colonization is more likely to be needed.

Earth will not be able to sustain the human race forever because of its reassures being diminished faster than they can replenished. Also humans are needing more space to live in because of overpopulating. Colonizing could fix the problem by moving. A new planet could offer us more opportunities to develop new ways of living.

Research tells us that the preparation for colonization of an Exoplanets will take a long time because of the calculations, construction, and researching the space crafts. Research also showed us there are many ways to travel through space as well. We chose 4 different types of space crafts.

1) Chemical fueled: This is the historic way of space traveling in space.

2) Solar sails: This is an extremely large incredibly thin film of material that catches the

sun’s radiation which builds up pressure from solar particles and pushes it forward in space. Doesn’t take up a lot of material because it only needs and thin layer of Mylar or aluminum to function.

 3) Laser sails: This space craft is almost identical to the solar sail but has a different fuel

method. Instead of the suns energy hitting the mylar or aluminum film, a man-made light

laser source will be the energy that hits the sail.

4) Nuclear blasts: Like the solar sail but instead of the sun’s rays as a fuel a nuclear

blast will be set off behind a shielded vessel. Therefore the blast provides thrust and

momentum.

 Using a model, we will evaluate these types of space travel, and evaluate which one we think might be best based on their fuel needs, possible accelerations, and the estimated travel times they might need to make an interstellar voyage.

**Problem solution**

To solve this problem we have made a NetLogo model that represents how the space ships would function as it travels through space to reach an Exoplanet. This model includes the following variable and procedures:

Distance: The distance it takes to get to Proxima centauri b is 4.24 light years. To get a better point of view of how far it is from the Earth. The distance it takes to get to Pluto times 7000 is roughly the distance of Proxima centauri b. so if that is true it would take 25 years or more to get there

Speed: Each ship has a different speed because of different propulsion methods and fuel types. The chemical fueled can reach the speeds of 17,500 mph, solar sail can get to 150000 – 200000, for nuclear blast and laser sail it is almost the same speeds as the solar sail or even faster.

Acceleration: Each one accelerates at different speeds as well. If the chemical fuel can accelerate at 1 gravity per year it would reach the planet Proxima centauri b in 25 years but it would take 2 cubed miles of fuel to even do that. The solar sail can accelerate 150000 over 3 years. The nuclear blast will accelerate slower but with more massive points. The first bomb put there has to be far away or else the speed that it will accelerate at will kill every one so you have to do it slowly. The man made light laser can acceleration very fast because the power is constant and can be changed up or down.

Fuel amount: The chemical fueled will need over 2 miles cubed to maintain its top speeds of 17,500 over a long periods of time to reach Pluto and it would not be enough to reach 4.24 light years so we need to find a more sufficient fuel. The nuclear blast will need a lot of bombs to reach its top speed but unlike a chemical fueled rocket it does not need to be constant because once it reaches its speed over time it can constantly maintain that speed unless it is manually slowed or stopped.

These calculations were done on all of our space craft types: A) Chemically fueled rockets B) Solar sail C) Laser sail D) Nuclear blast (all of these space craft’s look like pointer and have different colors to identify them)

We quickly found some basic results that helped us in determining what our recommendations would be for the construction of a vehicle capable of travel to an exoplanet which likely has the proper conditions and values to support life and which is in a near enough portion of our galaxy to be reached at sub-light speeds without any special provisions for cryogenic preservation of a crew.

Chemical fuel is the least efficient way of deep space travel for many reasons. The first reason is that it takes too long to get to far places, it does not have the space to hold enough fuel to get to the nearest Exoplanets which is where we are going to travel to. But if we modified the fuel to something else it could be possible within a reasonable time period.

Solar sails could be the solution to travel to the first Exoplanet without taking 100 decades to arrive there. It does not need to carry fuel with it because it runs of renewable energy from the sun that won’t run out by the time we get to the Exoplanet. It would need to take a lot of space but the material is incredibly thin.

Also research tells us that the preparation for colonization of an Exoplanets will take a long time because of the calculations, building, and researching the space crafts will take a while to do.

**Conclusion** In conclusion we have created a project that is based around understanding deep space travel and how this concept of space travel needs to be handled. Our recommendations are: solar sails, light laser sails, and nuclear blast driven craft should be researched and developed.

**Achievements**

 We now know more about space crafts in general and what researchers and astronauts have to think about when considering any travel to other planets. We learned more about the vastness of space and how difficult and time consuming space travels is.

**References**

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[www.sciencealert.com](http://www.sciencealert.com) – (For information on laser propulsions.)

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- THE EDGE OF TOMORROW:

- GUIDE TO EARTH AND SPACE:

- THE RELATIVITY OF WRONG:

- IS ANYONE THERE? :

- EXTRATERRESTRIAL CIVILIZATIONS: (For all the books, it helped me to learn more about physics and economical solutions and ideas for space travel and colonization.)