CALIFORNIA STATE SCIENCE FAIR
2015 PROJECT SUMMARY

Name(s)
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Project Number
J1723

Project Title
Ion Propulsion Efficiency

Abstract

Objectives/Goals
To find the most fuel efficient combination of plate charge and plate distance in a gridded ion engine.

Methods/Materials
Materials: A computer old enough to run Java plugins, and an Ion engine simulator with manipulatable plate charge and plate distance variables (JPL).
My experiment has 2 Independent variables each of which has 90 and 100 possibilities, I staggered them in increments of five, this brought the possible combinations from 9,000 down to 360.
Procedure:
1.Simulate all combinations
2.Collect Impulse (Efficiency) data
3.Heat map results (Plate distance x) (Plate charge y)

Results
See data at my display board due to the space requirements

Conclusions/Discussion
Data Analysis and Conclusion
The data shows that 30 and 35 plate distance both share peak efficiency at charge 100 (173 impulse). This implies that better efficiency could be achieved at plate distances between those numbers, although I lean more towards 30, because the data shows higher efficiency at 30. Slow and steady wins the race. Plate distances 40 and 45 are beating the others at 50 to 65 plate charge, but shortly after, their efficiency declines. This only gets worse; as plate charge is increased the sharp decline at the higher charge region and the sharp increase at the lower charge region are more extreme. I think the peak efficiency possible is probably at 32, 100. The fact that the peak is at 100 plate charge implies that if more charge were possible higher impulses could be reached.

Summary Statement
This project is about increasing efficiency in a relatively new propulsion technology, ion propulsion, in order to make space travel less expensive and more accessible.

Help Received
n/a