sites.google.com/
laser-sail-2016

Home:

Project to design a spacecraft with a sail pushed by laser for traveling to Alpha Centauri
Variables

- different laser wattages
- solar sail materials/gemoetries/shapes
- beyond solar system
- ...

starter p5 code is live now on mike's lasersail github account instead of google to hold our documents, links, models, etc...

========== GUI:
Thoughts about what users see; how they understand and control what is going on.
How many of (DJR's) 6 basic drawings can we use for GUI? {first 3 are raw data) (

- Who/What=portrait;
- hoWmuch=chart; Where=map;
- When=timeline;
- How=flowchart/cause&effect (mechanism?);
- Why=summary/story/equation/deduction & prediction (/original causality?))

========== Interactions:
1. Beam width
2. Material variables (strength, reflectiveness, specific heat)
3. Size of solar sail (area)
4. Shape of solar sail (angled as a corner reflector or otherwise)
5. Laser variables (Intensity, frequency, angle of divergence)
6. Time that laser is fired
7. Mass of whole craft

========== laser-data:
"If you project a typical two-millimeter-diameter laser beam 400 kilometers, or 240 miles (the altitude of Space Station), the resultant

beam diameter is about 1 kilometer. … the intensity of the laser beam falls in proportion to its cross-sectional area. In this case, an initial beam of 2 millimeters expanded to 1 kilometer, reducing the intensity by a factor of about 250 billion."
source: quoted in https://www.quora.com/If-I-point-a-laser-at-a-window-of-the-ISS-will-the-astronauts-be-able-to-see-the-dot/answer/Ben-Brown-3 with links http://www.airspacemag.com/daily-planet/a-flashing-success-114137238/ and http://www.universetoday.com/93987/amateur-astronomers-flash-the-space-station/
========== Materials Data:

Mylar: http://usa.dupontteijinfilms.com/informationcenter/downloads/Physical_And_Thermal_Properties.pdf
http://www.sciencedirect.com/science/article/pii/135901979190127N

========== other-sails:
See
- [ ] Description of "Breakthrough Starshot" (http://breakthroughinitiatives.org/) laser sail: http://earthsky.org/space/breakthrough-starshot-aims-for-alpha-centauri and here's followup info about an idea to slow down rather than pass by Alpha Centauri system
- [ ] See "project dragonfly" (http://www.centauri-dreams.org/?p=31478 great list of references!) from I4IS (http://i4is.org/news/dragonfly)
- [ ] See I4IS (Institute for Interstellar Studies http://www.i4is.org/)
- [ ] NASA solar sail "Sun Jammer"
- [ ] Japanese solar sail IKAROS probe
- [ ] LightSail-1 of the Planetary Society
- [ ] Centauri-dreams.org says "Greg Matloff recently proposed use of Graphene as a material for solar sails*. With an areal density of a fraction of a gram and high thermal resistance, this material would be truly disruptive. Currently existing materials have a much higher areal density; a number crucial for measuring the performance of solar sails." {*Matloff, G. L. (2012). Graphene, the Ultimate Interstellar Solar Sail Material? Journal of the British Interplanetary Society, 65, 378-381.}
- [ ] NASA interplanetary cubesat challenge http://sservi.nasa.gov/

articles/interplanetary-cubesat-challenge/
- [ ] centauriDreams.org and book "Centauri Dreams: Imagining and Planning Interstellar Exploration" by Paul Gilster (solar sails! Described by Berkeley astronomy prof and exo-planet finder Geoff Marcy, nytimes 2012 Nov 25. (Gilster also recommends book Star-Ark-Self-Sustaining-Spaceship edited by Rachel Armstrong.)
- [ ] NASA study of Guidance & Navigation Control for solar sails: ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20040121136.pdf
========== Possible simulation systems/languages:

- Mathematica (we have school license, for classrooms, students and teachers— can have home installs—and it can run in a web browser).
- ntrs.nasa.gov/archive/nasa/casi.ntrs.nasa.gov/20040121136.pdf
- https://catalog.data.gov/dataset/comprehensive-**solar-sail-simulation**-project
- ccar.colorado.edu/asen5050/projects/projects_2007/burkert_proj/
  - GMAT NASA Simulator: http://gmatcentral.org
  - Orbit calculating spreadsheet: https://docs.google.com/spreadsheets/d/1RlbS3bZKIh7zYJ_UpbvrOCry8cT7SDfa0h4JhCzqfGY/edit#gid=0
  - http://www.georgedishman.f2s.com/solar/Calculator.html
  - Stella Pro or iThink software from iseesystems.com for simulating dynamic systems (education prices (603) 448 - 4990; sales@iseesystems.com, 30 day free trial avail;). Hmm, I'm not sure which version of their software we want nor what it costs.
  - Cole C. suggests using "ansys.com" or a "multiphysics" tool. (Note: wikipedia page about CAE (computer aided engineering) lists multiple open-source programs in the purple "CAE Software" box at the bottom of the page. (Press the "[show]" button if the list doesn't show.))

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