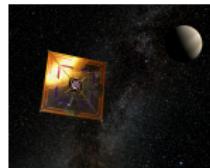




Arg: OpenMoji

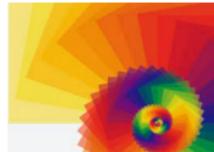


Arg: Wikipedia

Eguzki bela-ontziak

Argi-bidezko hegaldiak espazioan
Erregairik gabeko hegaldiak espazioan

Unai Aldasoro eta Mikel Antoñana



Edukiak

- 1 Testuingurua
- 2 Misioak
- 3 Baliagarritasuna eta mugak
- 4 Etorkizuna

Atala

1 Testuingurua

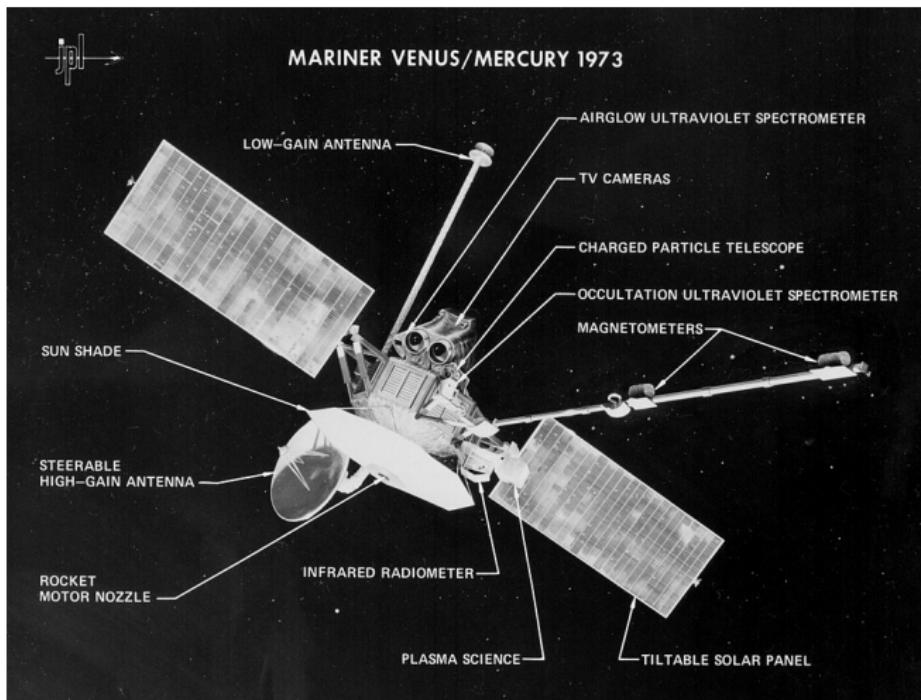
2 Misioak

3 Baliagarritasuna eta mugak

4 Etorkizuna

Mariner 10

Bideoa (1:19min)



Arg: NASA / Jet Propulsion Laboratory

Google Books Ngram Viewer

- Solar Sail



- Protagonistak: NASA, JAXA eta The Planetary Society
ESA?

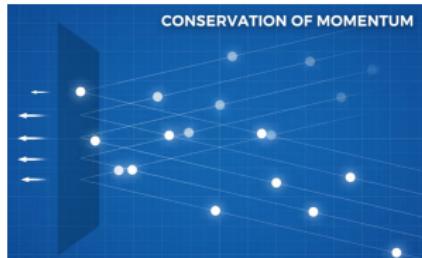
Fenomeno fisikoa

Zerk eragiten du mugimendua?

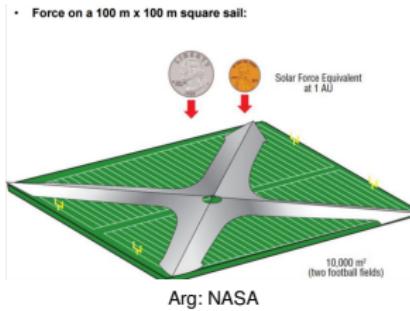
Arg: Crookes Radiometer (1873)

Fenomeno fisikoa

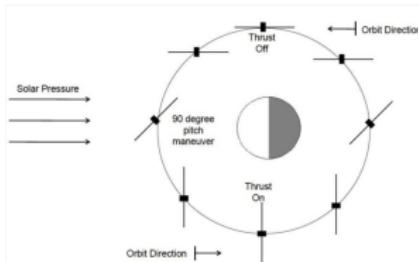
Eguzki argiaren presioa



Arg: How to sail on Starlight



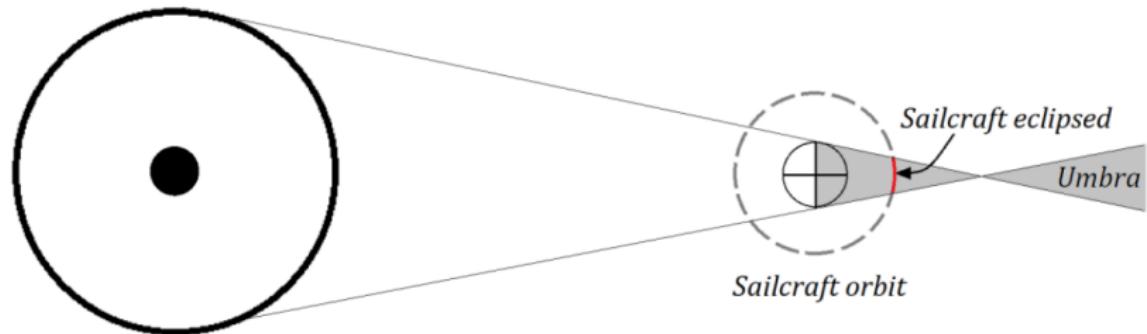
Arg: NASA



Arg: Solar Sailing, C.R. McInnes (2004))

Fenomeno fisikoa

Ilunpean?



Arg: Embry-Riddle Aeronautical University

Atala

1 Testuingurua

2 Misioak

3 Baliagarritasuna eta mugak

4 Etorkizuna

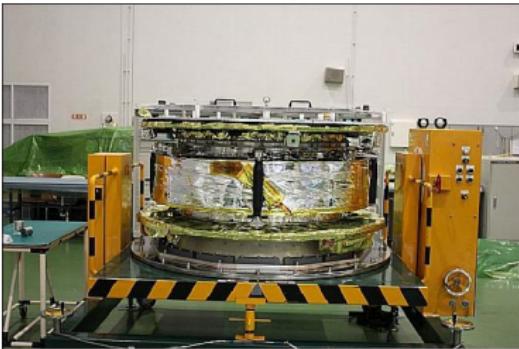
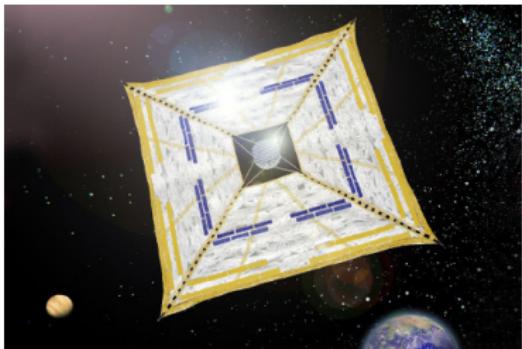
IKAROS misioa (2010)



Arg: JAXA

IKAROS misioa (2010)

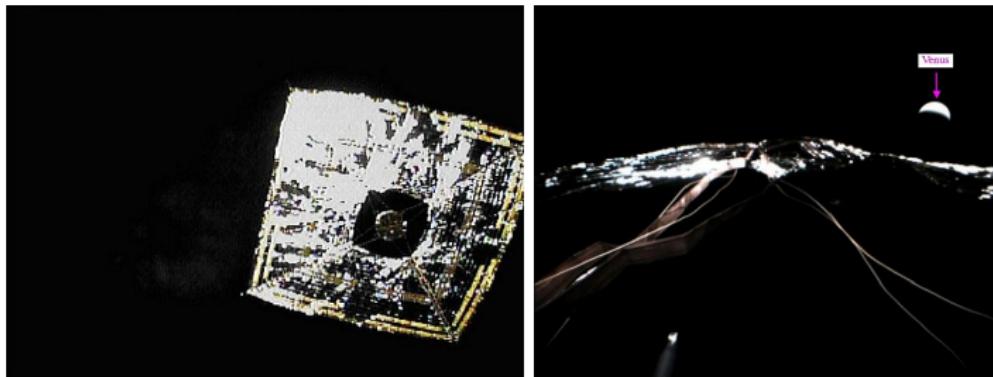
Diseinua



Arg: JAXA

IKAROS misioa (2010)

Bidaia



Arg: JAXA

LightSail 2 (2019)

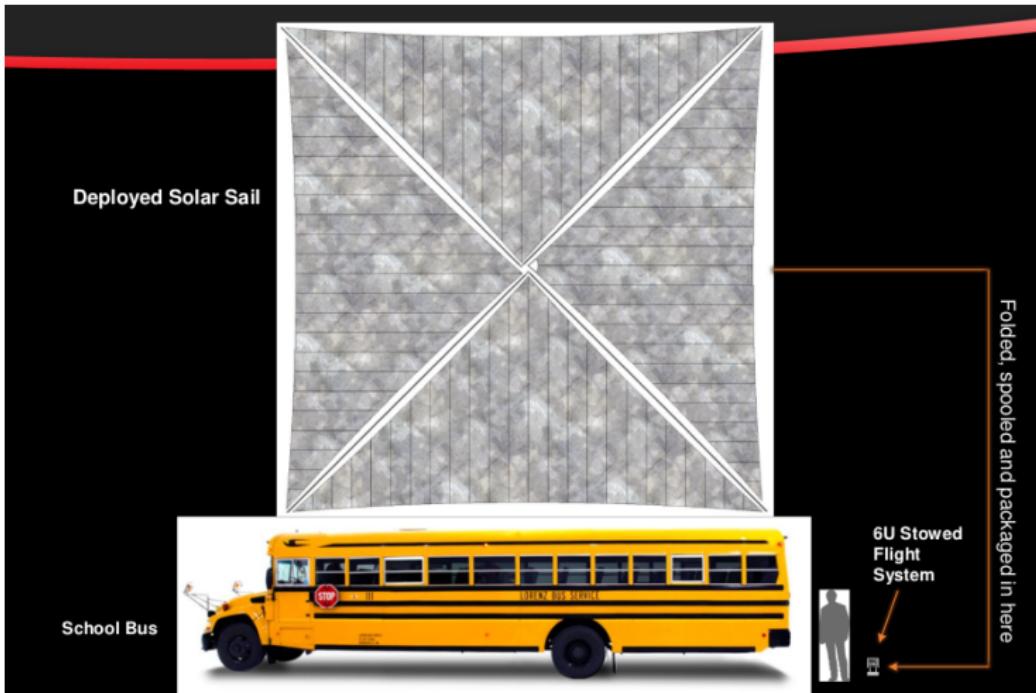
Bideoa 3:01min



Arg:The Planetary Society

LightSail 2 (2019)

Materialak, tamaina, masa



LightSail 2 (2019)

Non dago oraintxe bertan?

The image shows the Lightsail 2 Mission Control interface. At the top center is the Lightsail 2 logo, which is a shield-shaped emblem featuring a sailboat against a sunburst background, with the text "THE PLANETARY SOCIETY" at the top and "LIGHTSAIL 2" in the center. Below the logo, the text "LIGHTSAIL 2 MISSION CONTROL" is displayed in large white letters, followed by "LAST DATA RECEIVED: OCTOBER 23, 2021 @ 21:19:39 UTC". The interface is divided into several sections:

- ELAPSED MISSION TIME:** 845 days 12 hrs
- SAIL STATUS:** ✓ deployed
- BATTERY CHARGE:** 3.85 volts (MAX 4.2V)
- INTERNAL TEMPERATURE:** 52.5 °C | °F
- ROTATION RATES:** 0x -0.4y -0.4z (DEG/SEC)
- ATTITUDE CONTROL MODE:** Solar Sailing

Atala

1 Testuingurua

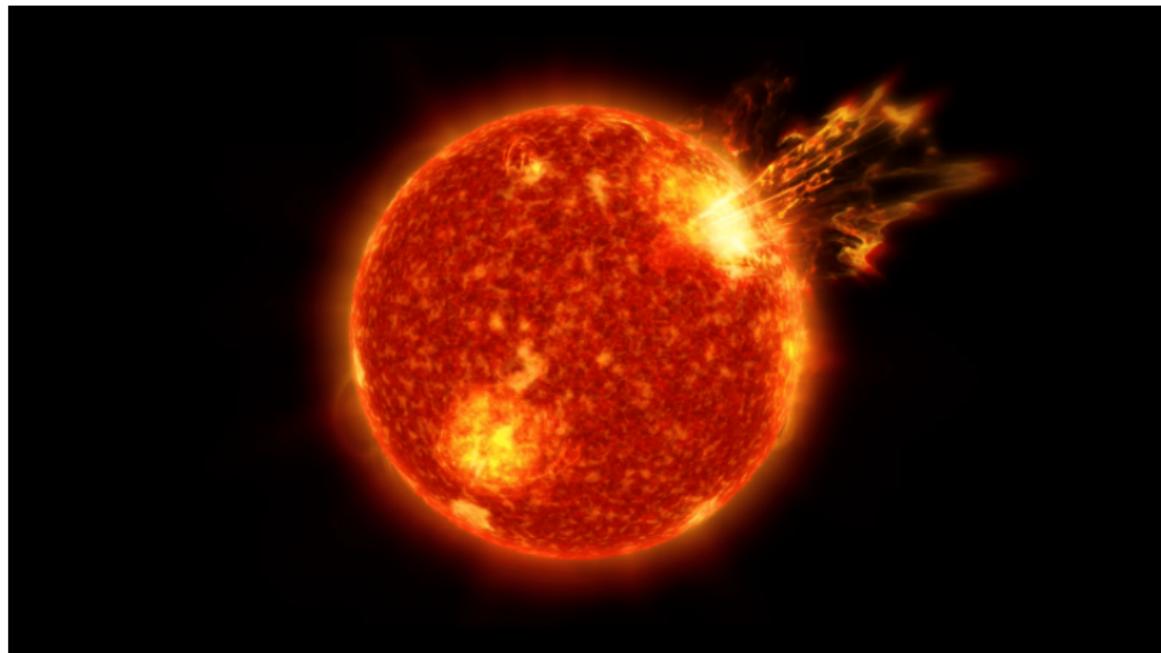
2 Misioak

3 Baliagarritasuna eta mugak

4 Etorkizuna

Larrialdiak

Eguzki ekaitzak



Arg: NASA's Goddard Space Flight Center/Genna Duberstein

Larrialdiak

Asteroideen inpaktuak lurrean (kezkatu beharko genuke?)



→ RISK LIST

Last update: 2021-10-25 15:07 UTC

The Risk List
is a
catalogue of
all objects for
which a non-
zero impact
probability



Current number of NEAs in risk list:

1229

Arg: ESA

De-Orbit Aplikazio komertziala

- 20.000 objektu lurraren inguruan !!!
- De-Orbit System HPS GmbH (Bideoa 0:39seg)



Arg:ESA

Mugak

Pertsonen garraioa



Ag: NASA Dominio público: HAM txinpanzea (1961)

Atala

1 Testuingurua

2 Misioak

3 Baliagarritasuna eta mugak

4 Etorkizuna

Etorkizun hurbilean

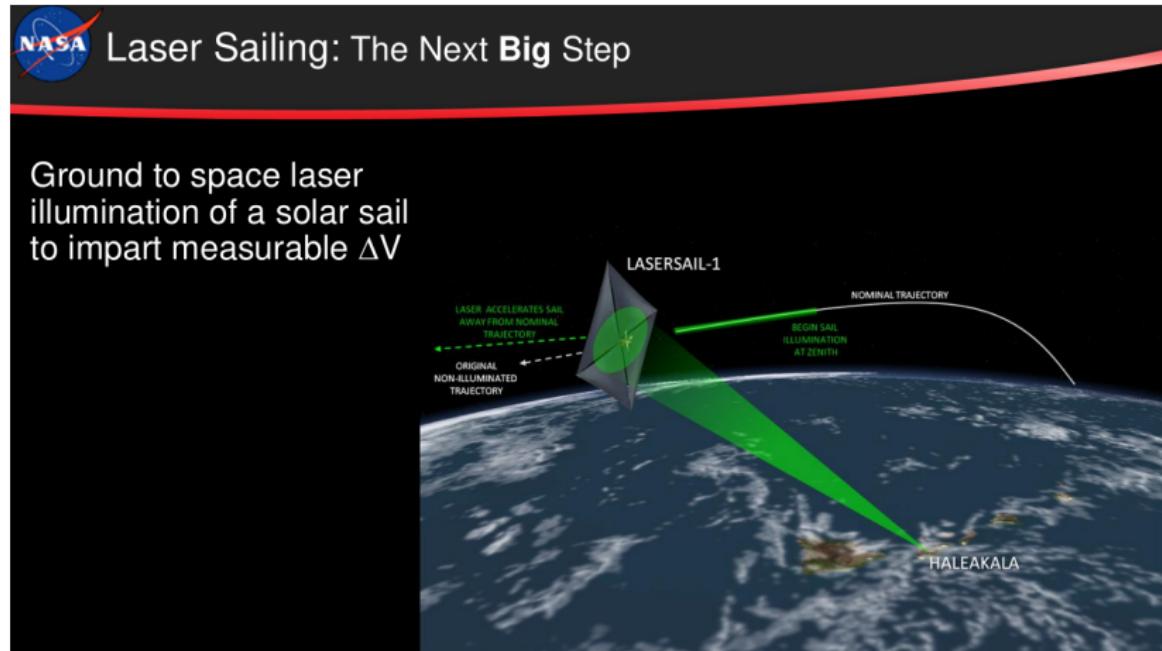
Ilargirako Artemis-I misioan (Otsaila 2022)

The screenshot shows the official website for the NEA Scout mission. At the top left is the NASA JPL logo with the text "Jet Propulsion Laboratory California Institute of Technology". To the right are navigation links: "About JPL", "Missions" (which is underlined), "News", "Galleries", "Engage With JPL", and "More". A search icon is also present. Below the header, a large image of a dark, rocky asteroid is shown against a star-filled background. A white diamond-shaped graphic overlaps the bottom right of the image. In the center, the words "NEA Scout" are written in large, bold, white letters. Below this title, a paragraph of text describes the mission: "NEA Scout is an exciting new mission that was recently selected by NASA's Advanced Exploration Systems (AES) by a team from the Jet Propulsion Laboratory and Marshall Space Flight Center." At the bottom left, there is a red-bordered button with the text "VISIT MISSION WEBSITE" and a small external link icon.

Arg NASA

Etorkizun luzean

Zientzia-fikzio?



Arg: NASA

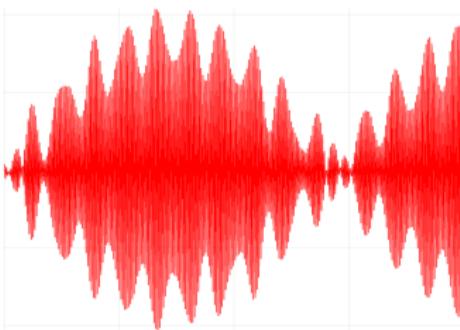
Erreferentzi interesgarriak

● Artikuluak

- 1) **Eguzki-bela (wikipedia)** Euskarazko erreferentzia !!!
- 2) **Solar Sailing - Technology, Dynamics and Missions Applications**, Colin R. McInnes- Springer (2004)
- 3) **Solar sail technology—A state of the art review**, Bo Fu, Evan Sperber, Fidelis Eke- Progress in Aerospace Sciences (2016)
- 4) **Solar Sailing – Mission Opportunities and Innovative Technology Demonstration**, C.R. McInnes et al. ESA bulletin 108 (2001)
- 5) **The LightSail 2 solar sailing technology demonstration**, David A. Spencer et al. - Advances in Space Research (2021)
- 6) **The Planetary Society** erakundearren webgunea
- 7) **Maketa: LightSail 2 full-scale paper model**

● Bideoak

- 1) Bill Nye Explains the Science Behind Solar Sails
- 2) How to sail on Starlight
- 3) How Solar Sails Are Remaking Space Exploration



Eskerrik asko zuen arretagatik

unai.aldasoro@ehu.eus

mikelantonana@ehu.eus

Aurkezpena helbide honetan eskuragarria:

- <https://github.com/mikelehu/Zientzia-Astea-2021>