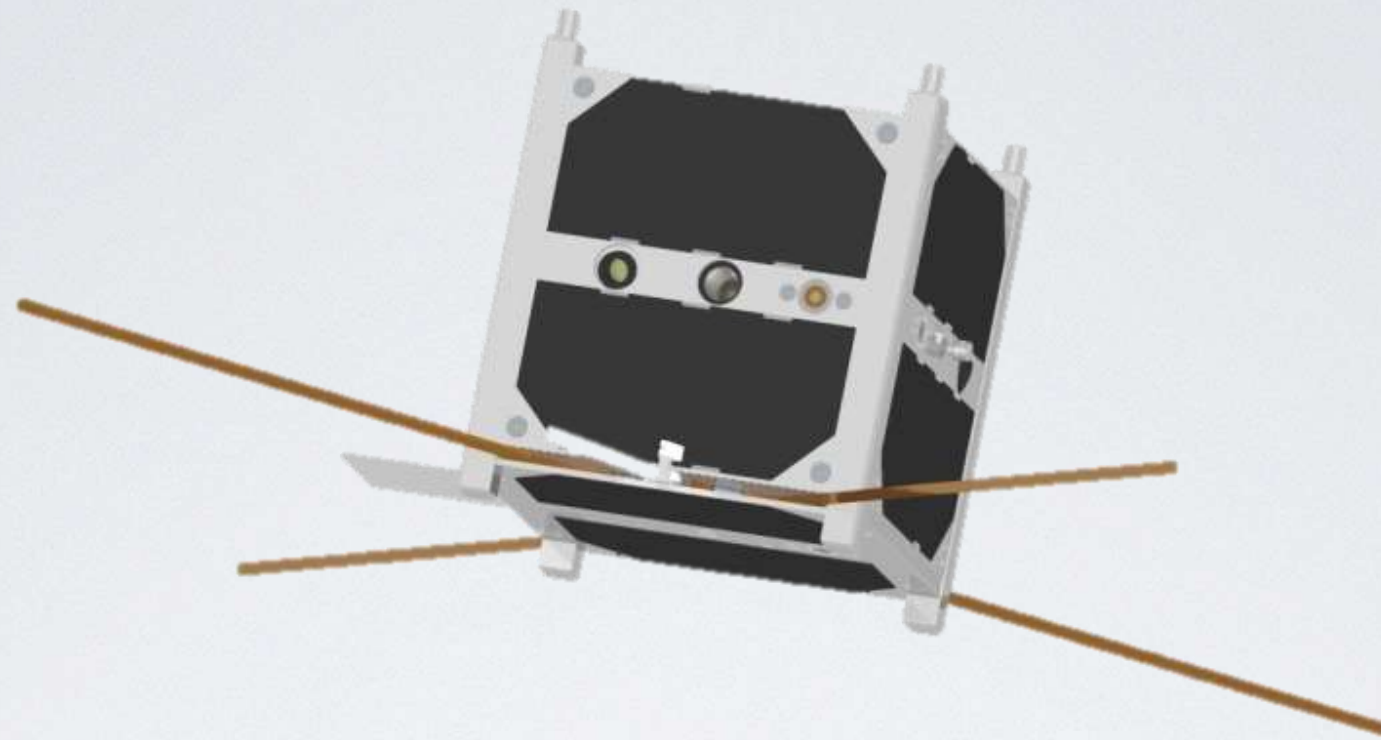
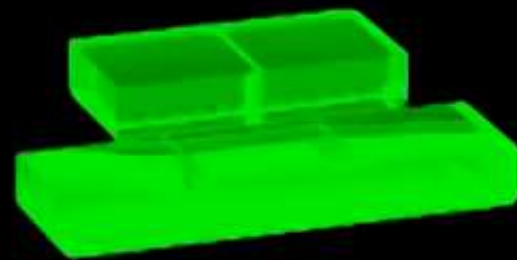




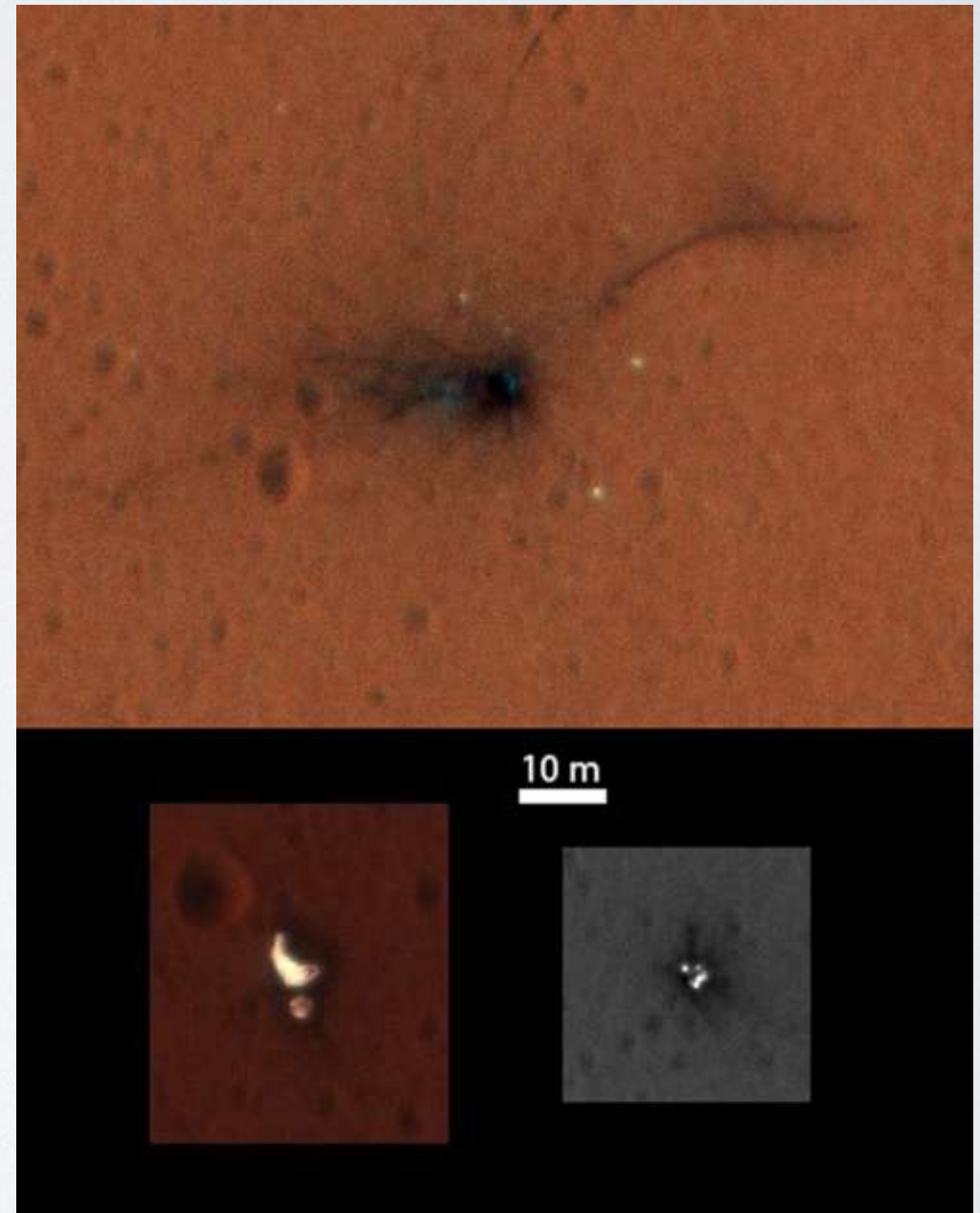
CUBESATY

Hračky alebo budúcnosť kozmického
výskumu?



VEISMÍR CHYBY NEPRIPÚŠŤA

- Strata Hitomi
- “Anomália” Falcon 9
- “Pristátie” EDM





Powered by



PÔVODNÝ PLÁN

- 7.1. 2016 predstavenie družice
- Marec 2016 integrácia družice
- Máj 2016 štart *
- Príjem a spracovanie dát



ĎALŠÍ PLÁN

- 7.1. 2016 predstavenie družice
- Apríl 2016 integrácia družice
- Máj 2016 integrácia družice
- **29. august 2016** kontrola stavu družice
- **9. september 2016** integrácia na 2. stupeň Falcon 9
- Koniec októbra štart





SÚČASNÝ PLÁN?

- 7.1. 2016 predstavenie družice
- Apríl 2016 integrácia družice
- Máj 2016 integrácia družice
- 29. august 2016 kontrola stavu družice
- **December 2016 kontrola stavu družice**
- **ŠTART???**





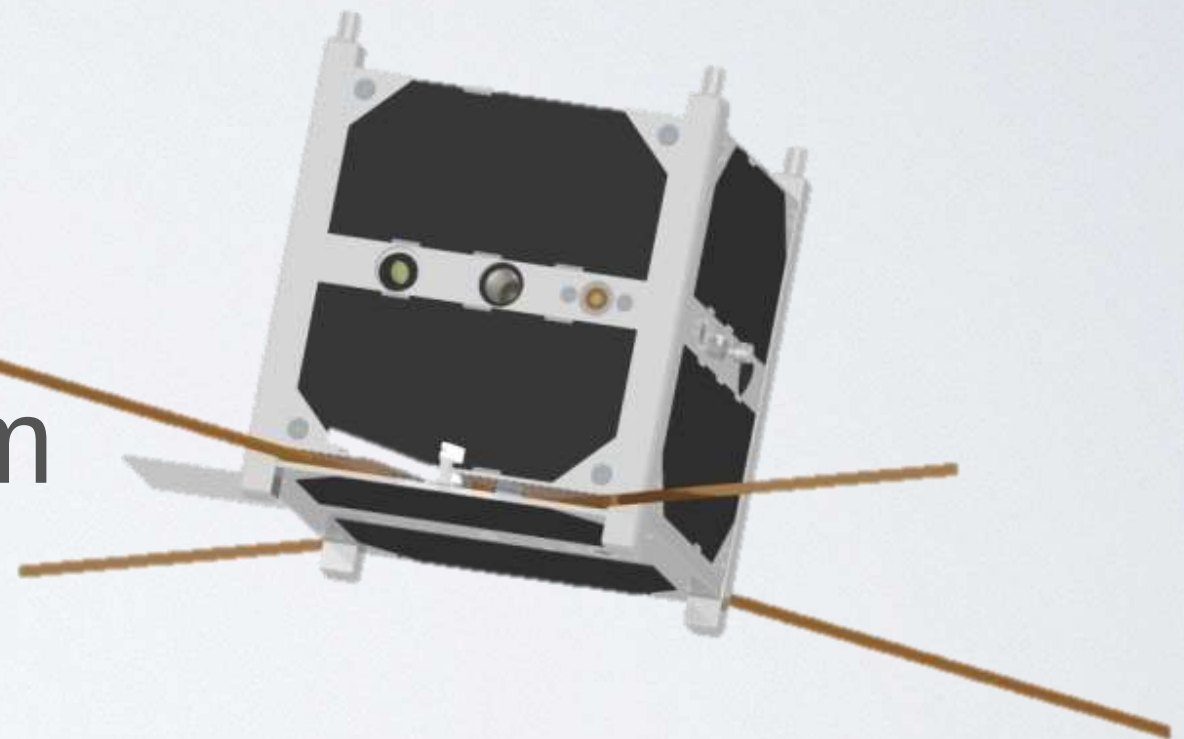
- 5 rokov
- 50 ľudí
- 3 univerzity
- Cca 20 tech. spoločností
- Štátne inštitúcie



SKCUBE



- 1U cubesat
- Rozmery 10x10x13,5 cm
- Hmotnosť 1056 g



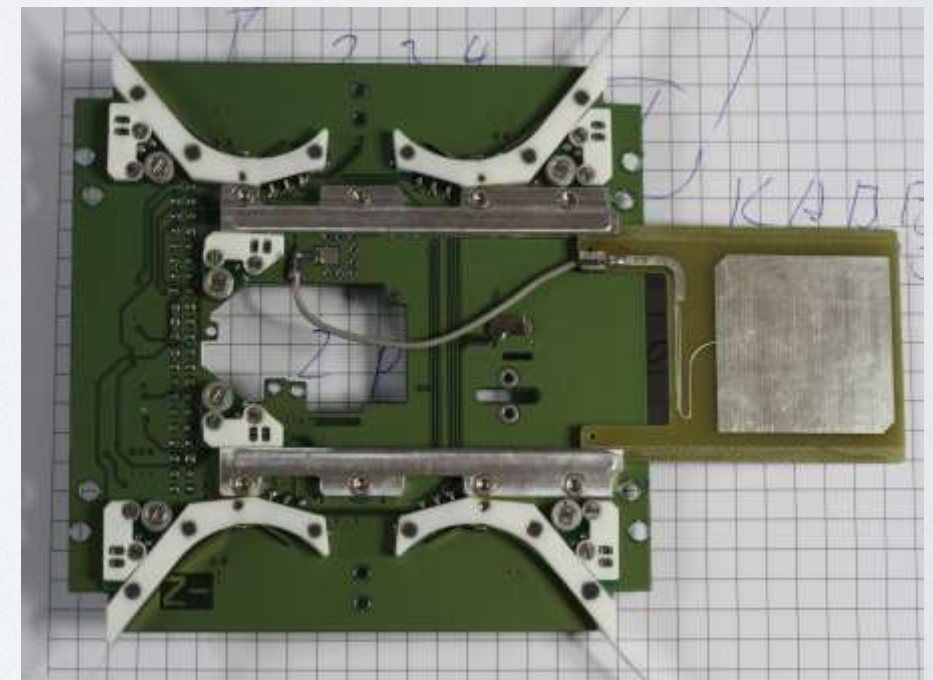
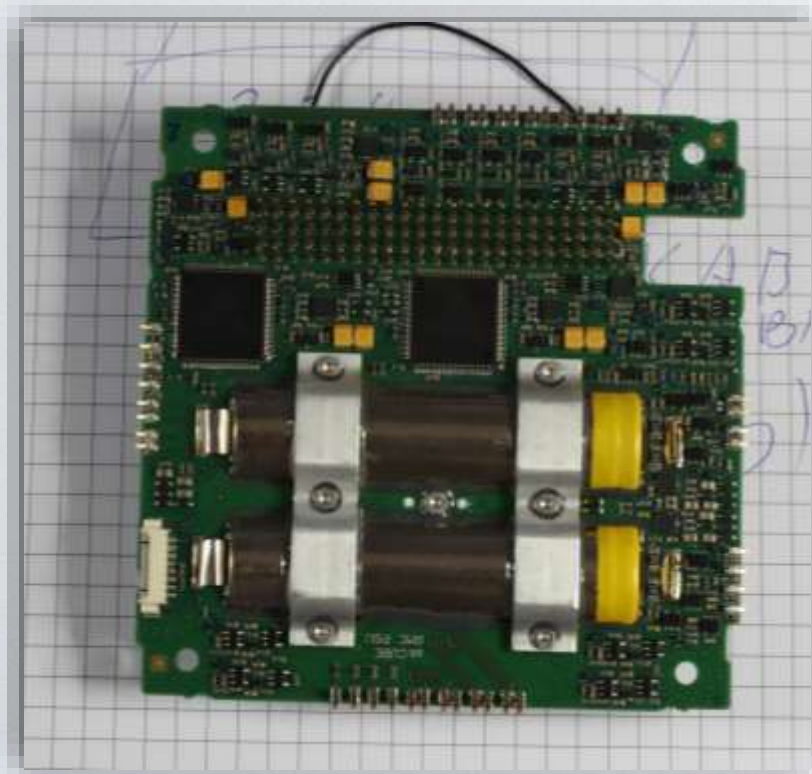
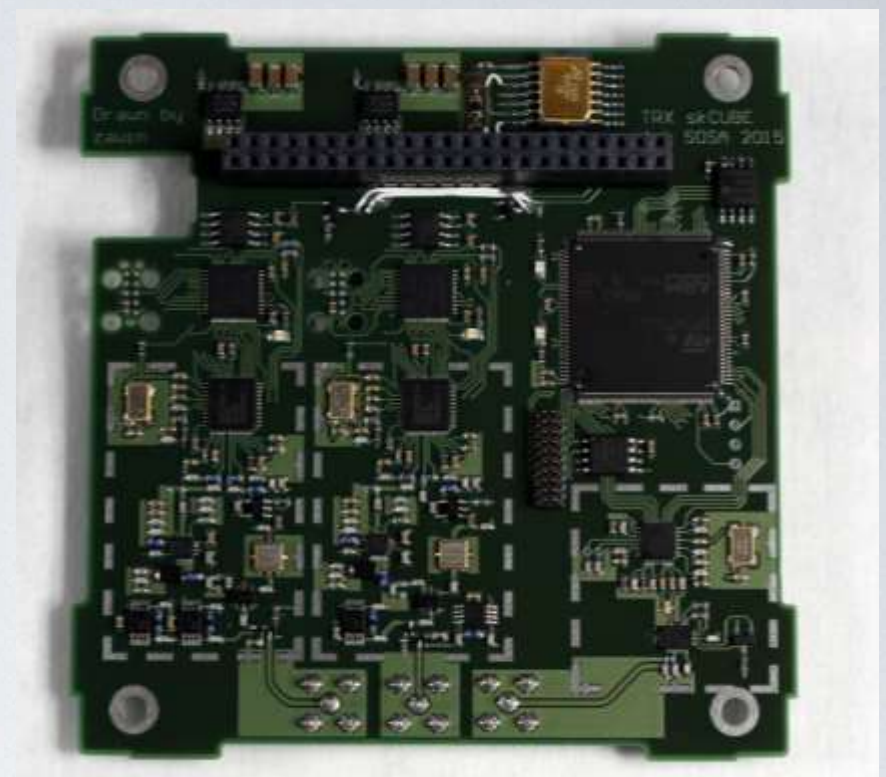
PREČO DRUŽICA?



- Ukázať slovenský potenciál
- Vypustiť konečne slovenský satelit
- **Viac technológov a technológií pre Slovensko (know-how)**
- Priviesť Slovensko do ESA
- Získať cenné dáta

- Palubný počítač
- Napájací systém
- Komunikačný systém
- Senzorický systém
- ADCS
- Experimenty
- Kamera





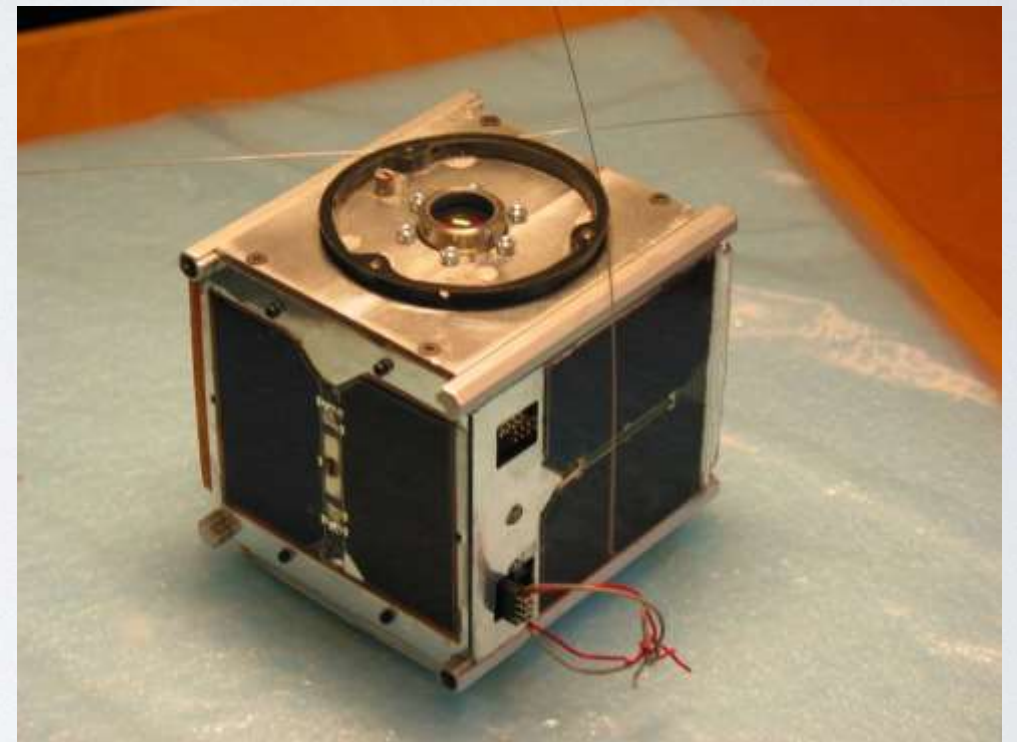
INOVÁCIE V KOCKE

- Redundancia (OBC, PSU a TRX zdvojené)
- Vlastný unikátny RTOS
- Unikátne sunsenzory
- Riešenie ADCS
- Vysokorýchlostný prenos na 13cm pásme
- VLF experiment



HISTÓRIA

- Cubesat štandard 1999
- Jordi Puig-Suari (California Polytechnic State University) a Bob Twiggs (Stanford University)
- Prvé vypustené cubesaty 2003



AAUcubesat (2003)

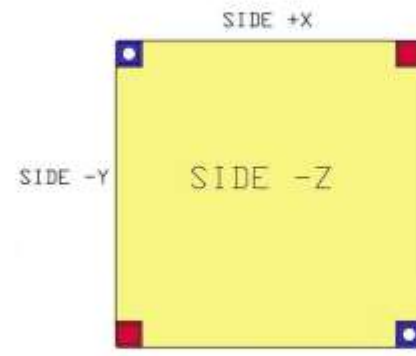
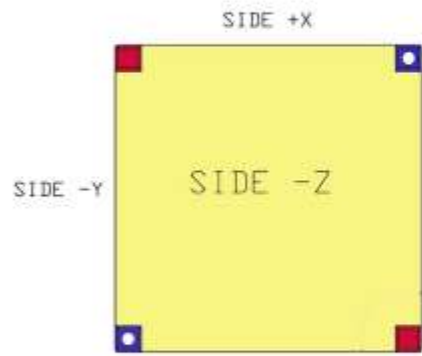
PLACEMENT OPTIONS FOR DEPLOYMENT SWITCHES AND SEPARATION SPRINGS

■=DEPLOYMENT SWITCH

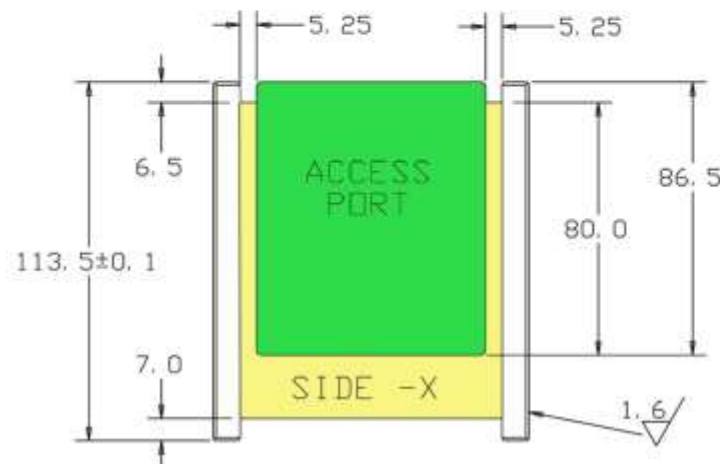
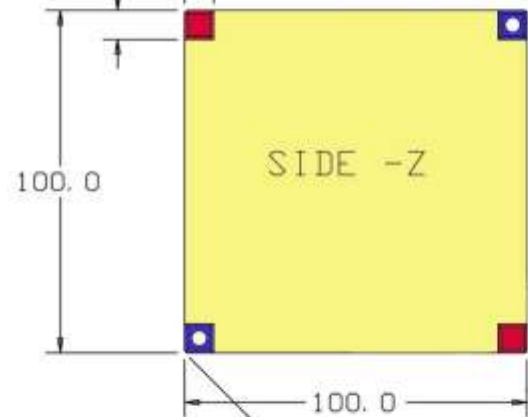
■=SEPARATION SPRING

OPTION A

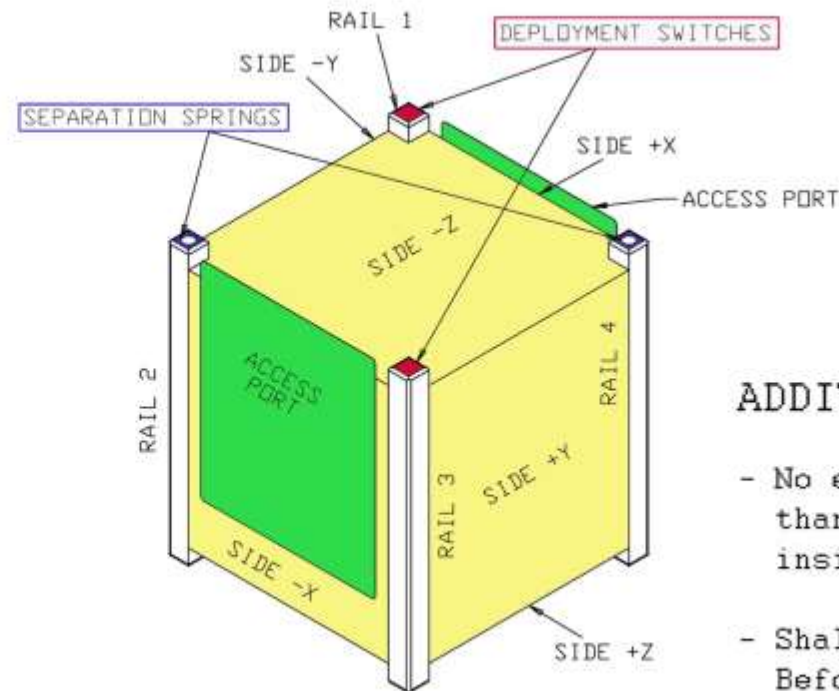
OPTION B



8.5 MIN



141.2^{+0.0}_{-1.5}

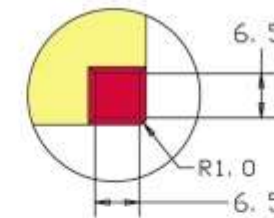


NOTE: Deployment switch and separation spring placement schemes shown in Option A and B. Deployment switch(es) should be compatible with +Z contact points.

ADDITIONAL NOTES:

- No external components other than the rails shall touch the inside of the P-POD.
- Shall incorporate a Remove Before Flight pin OR launch with batteries fully discharged.
- Rails shall be aluminum hard anodized.
- At least one (1) deployment switch shall be incorporated on all CubeSats.
- Center of gravity shall be located within a sphere of 2 cm from its geometric center.
- Separation springs can be found at McMaster Carr (P/N 84985A76).

CONTACT DETAIL FOR SIDE +Z



ALL DIMENSIONS IN MILLIMETERS UNLESS OTHERWISE NOTED.

ROUND ALL EDGES AND CORNERS.

±0.1 mm OR BETTER.

CUBESAT SPECIFICATION

REV: 12

CALIFORNIA POLYTECHNIC STATE UNIVERSITY
AEROSPACE ENGINEERING DEPARTMENT
SAN LUIS OBISPO, CA 93407
(805) 756 - 5087

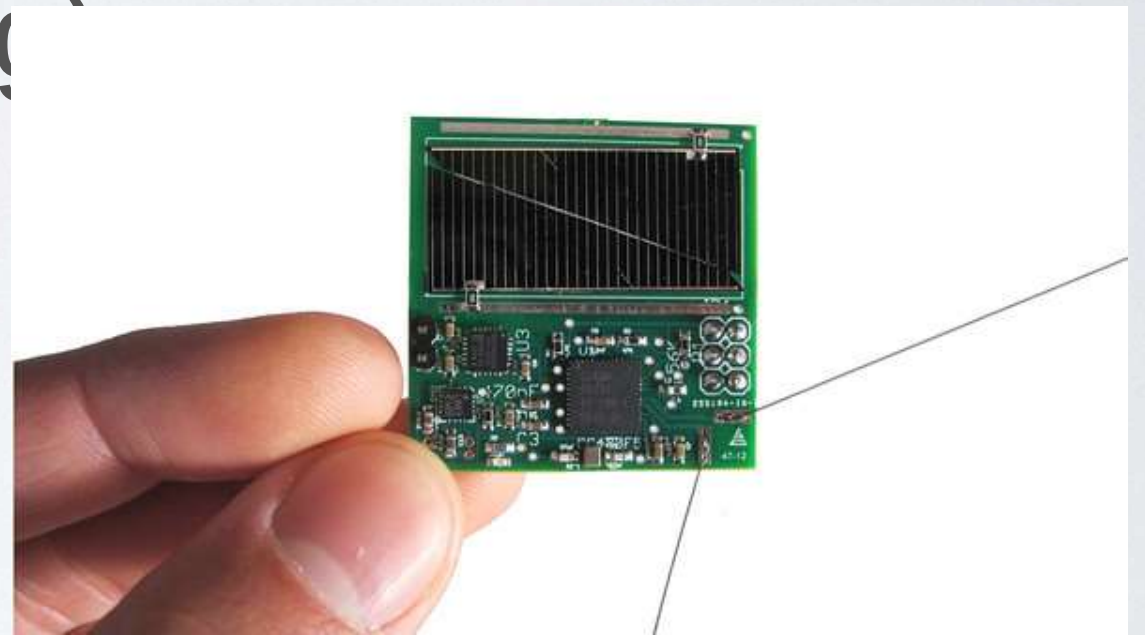
DATE: August 1, 2009

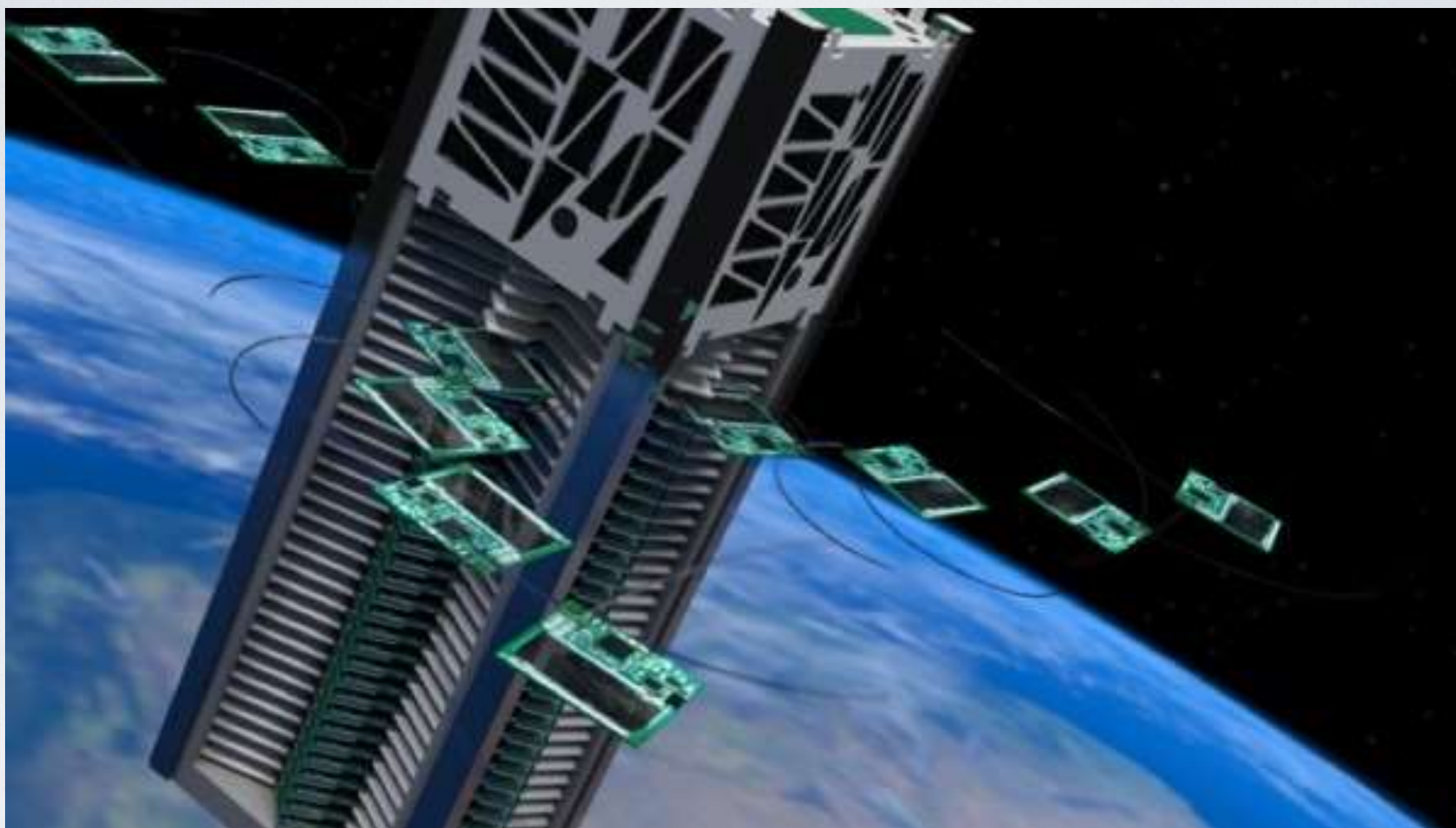
NOT TO SCALE



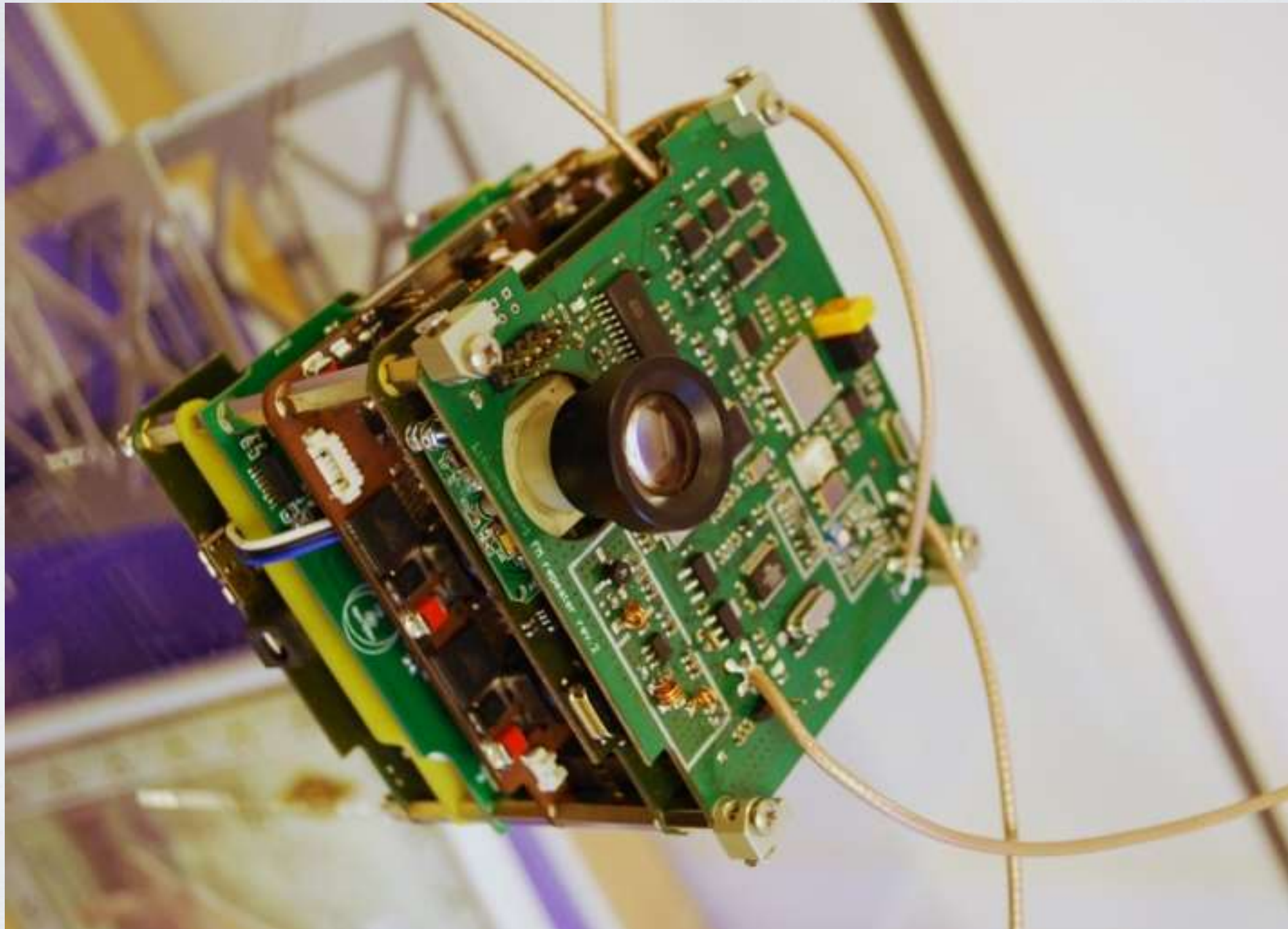
VEĽKOSTI SATELITOV

- Minisatellite (100–500 kg)
- Microsatellite (10–100 kg)
- Nanosatellite (1–10 kg)
- Picosatellite (0.1–1 kg)
- Femtosatellite (0.01–0.1 kg)



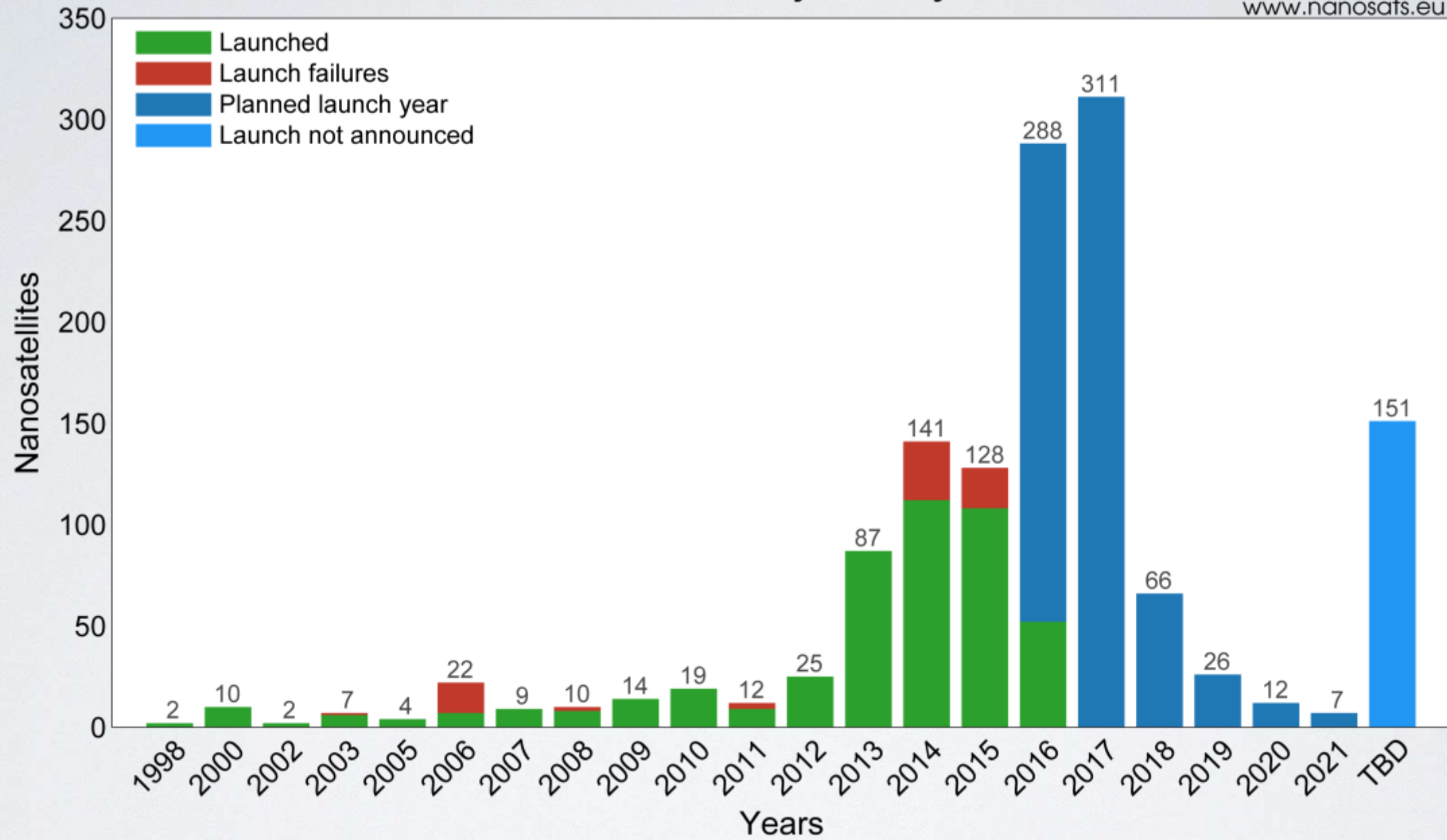


ŠTUDENTSKÉ SATELITY



Nanosatellites by launch years

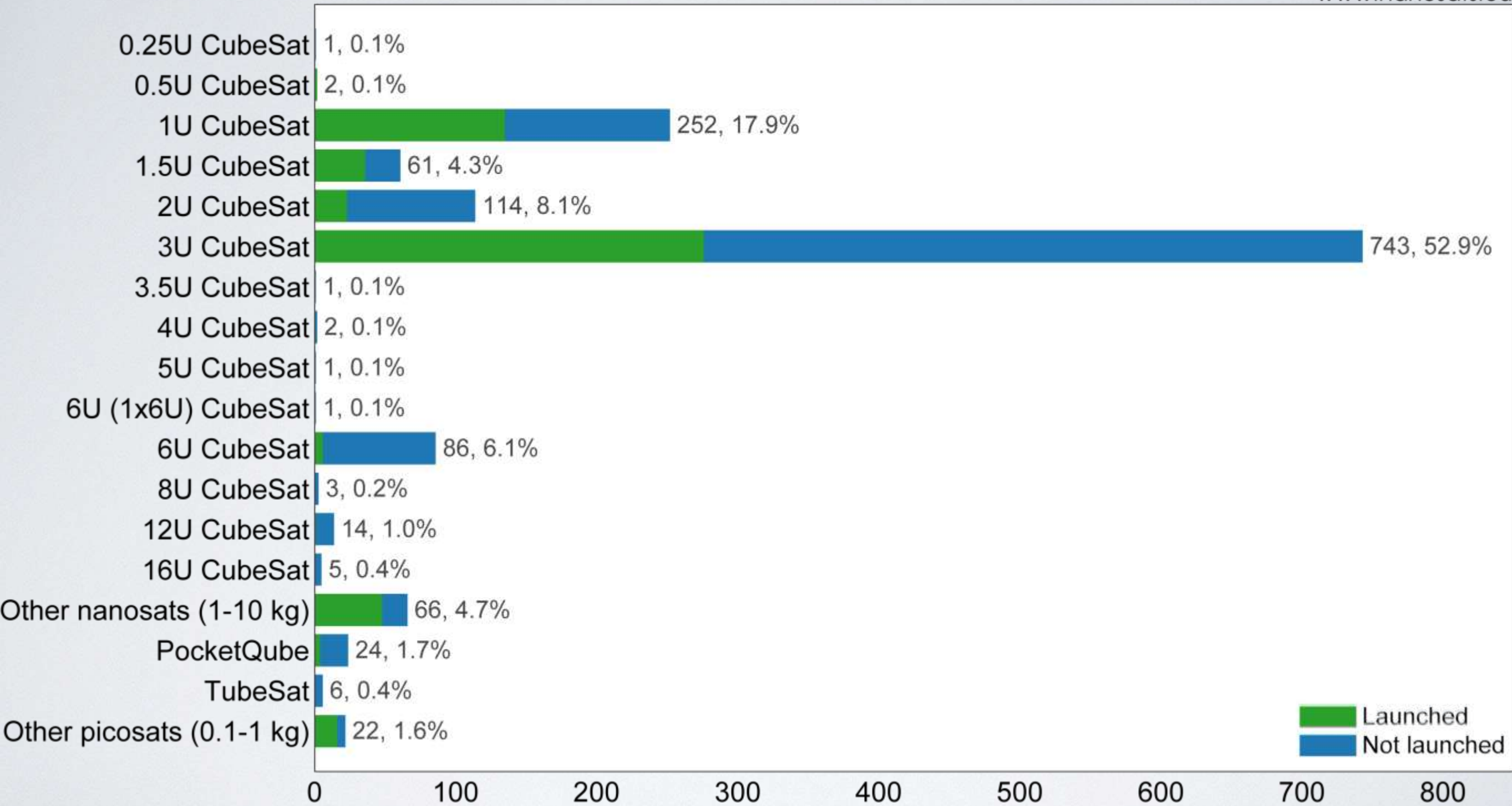
www.nanosats.eu



Note! At this time QB50 and SHERPA are still scheduled to launch in 2016 among many others.

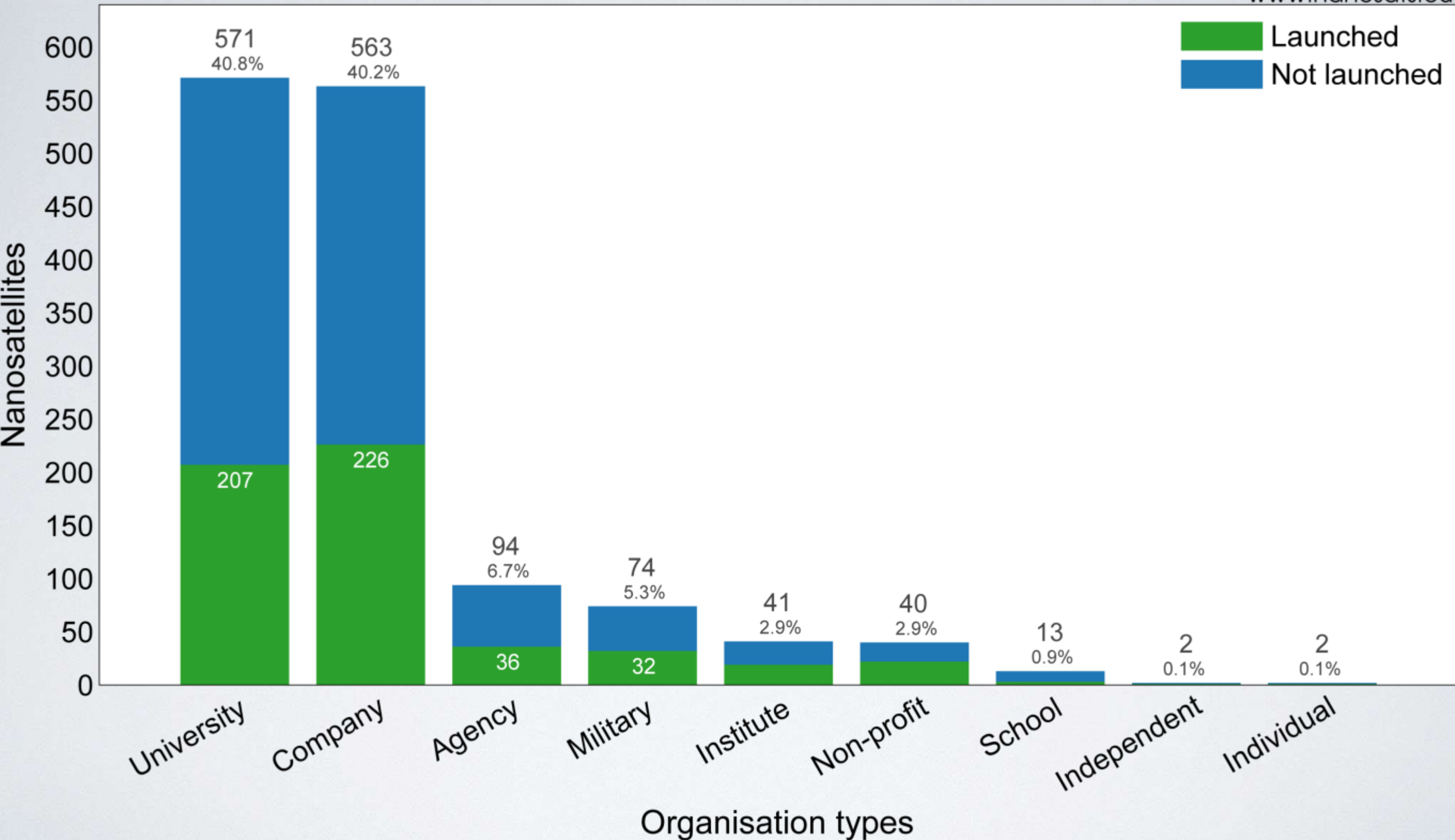
Nanosatellites by types

www.nanosats.eu



Nanosatellites by organisation types

www.nanosats.eu



CUBESATY SPRÍSTUPNILI
VESMÍR PRE VŠETKÝCH

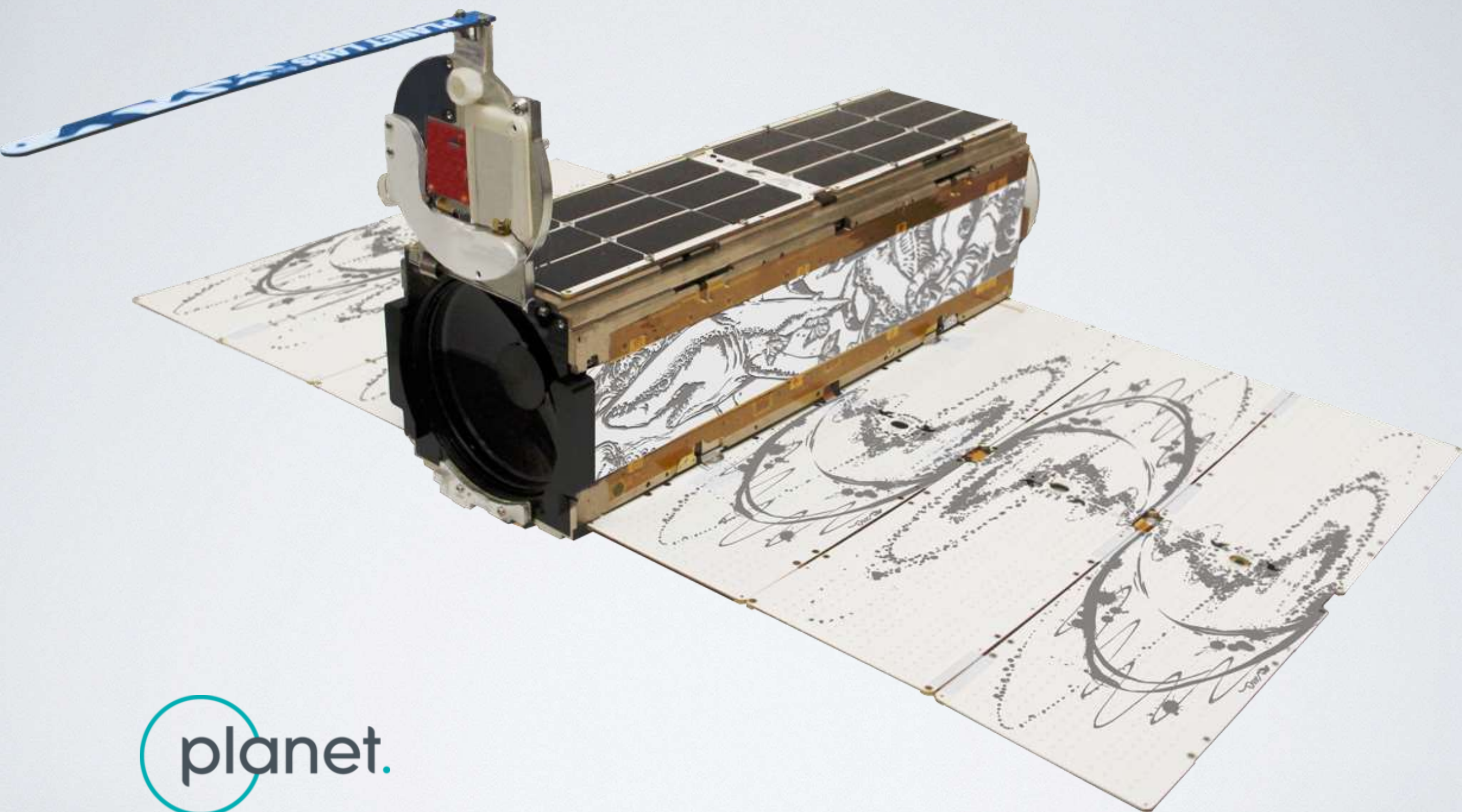
VÝHODY CUBESATOV

- Štandardizácia
- Nízka cena
- Škálovateľnosť
- Backup





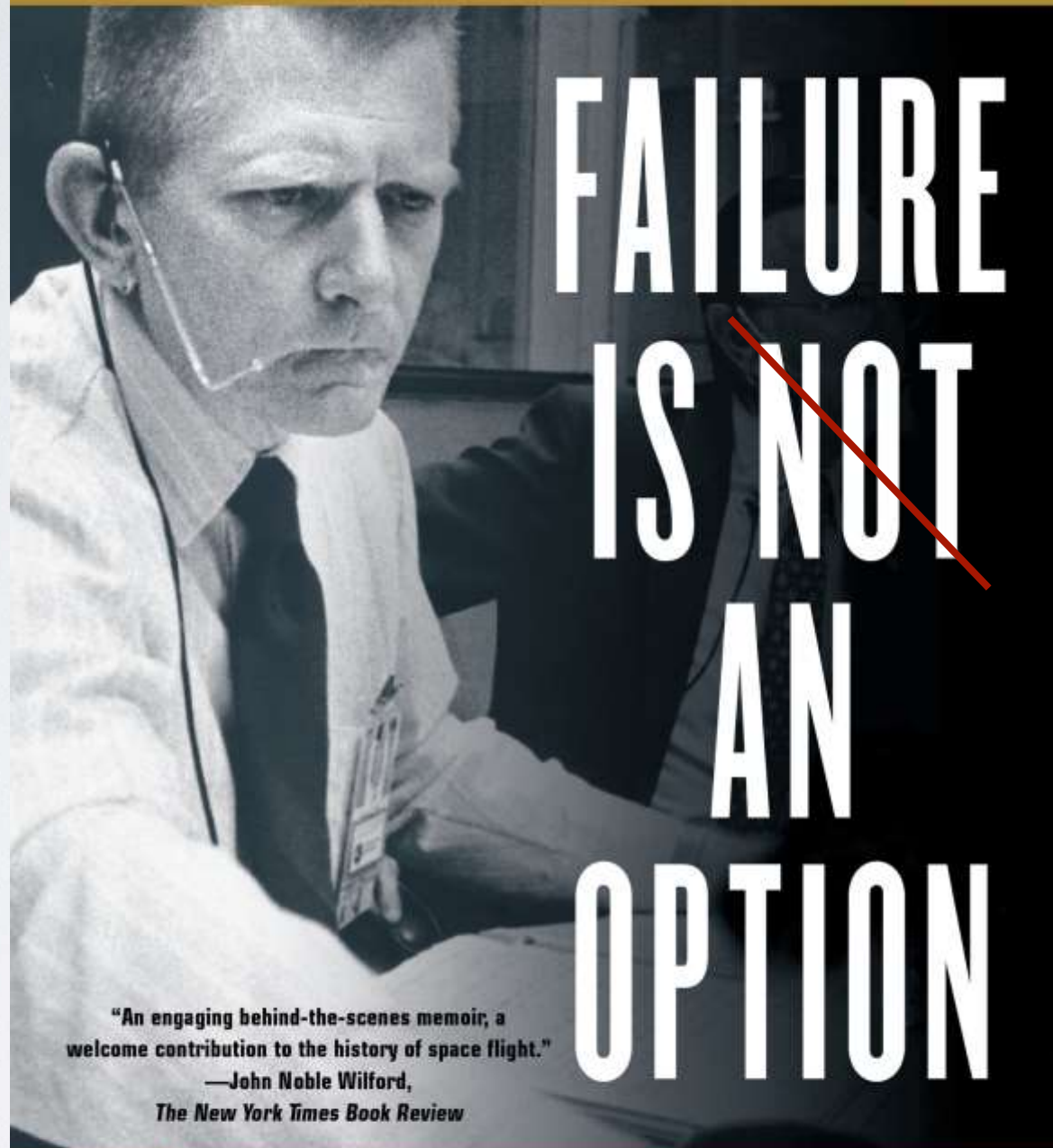
GOMSPACE





- V roku 2015 dosiahli hranicu **101** cubesatov na LEO
- V roku 2016 vypustili **12** (PSLV-C34), **20** (Cygnus CRS OA-6)
- Pri havárii Antares a Falcon 9 prišli o **34** cubesatov

THE NEW YORK TIMES BESTSELLER



FAILURE IS NOT AN OPTION

"An engaging behind-the-scenes memoir, a welcome contribution to the history of space flight."

—John Noble Wilford,
The New York Times Book Review



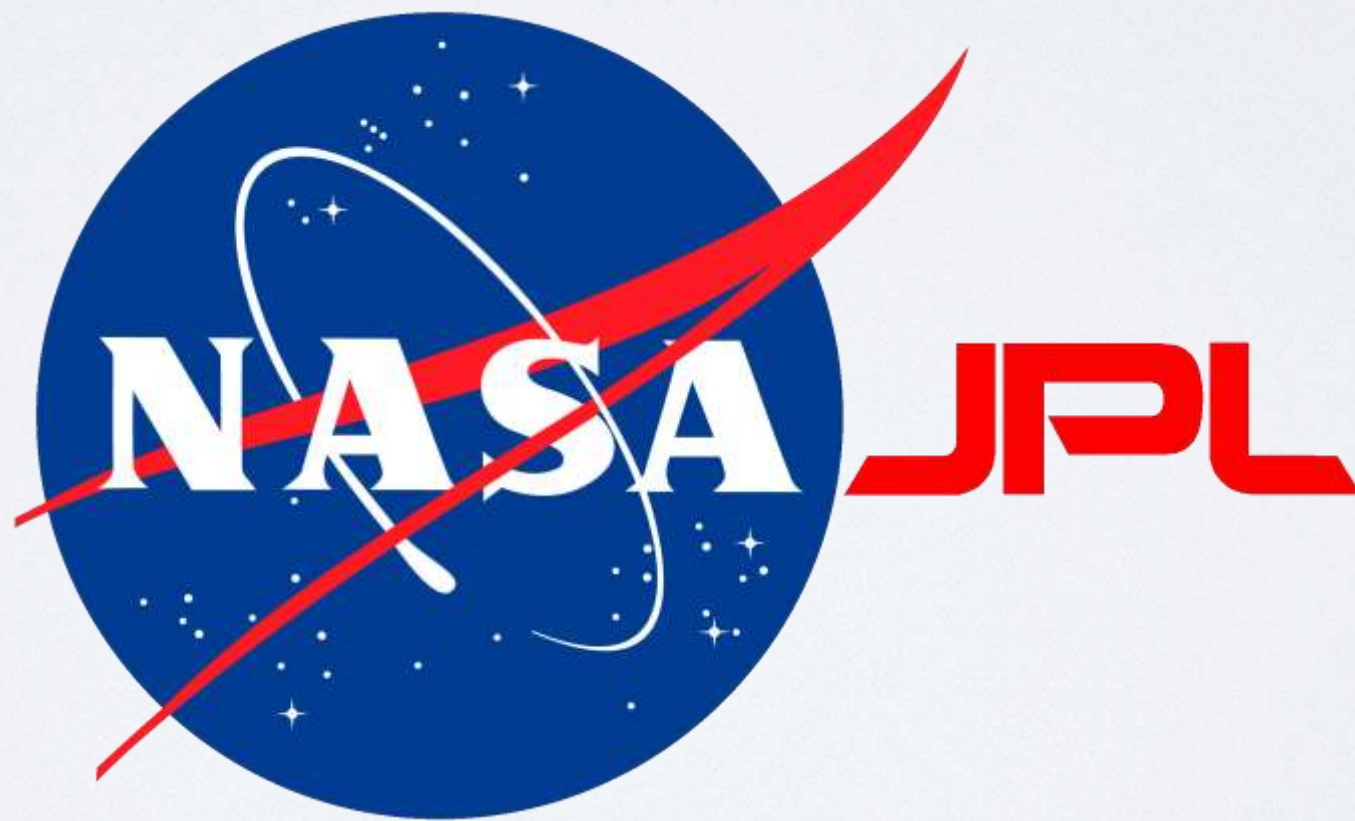
MISSION CONTROL FROM MERCURY
TO APOLLO 13 AND BEYOND

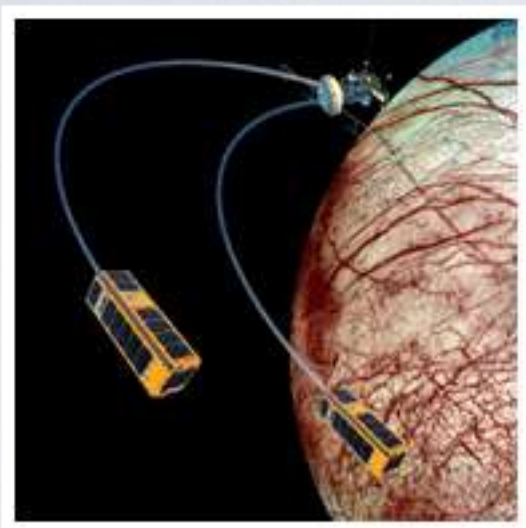
GENE KRANZ

FORMER FLIGHT DIRECTOR, NASA



ÉRA CUBESATOV VO VESMÍRE





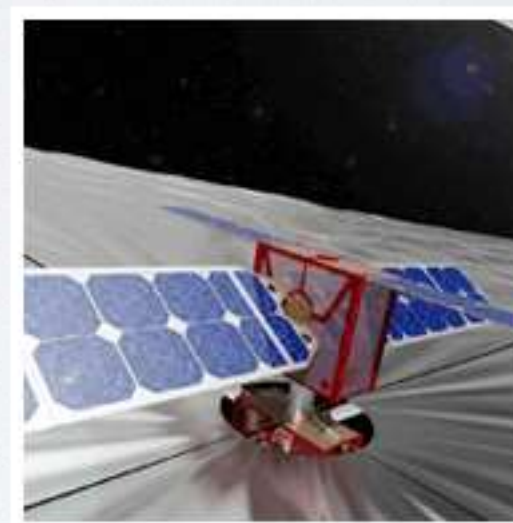
Planetárne vedy



Pozorovanie Zeme

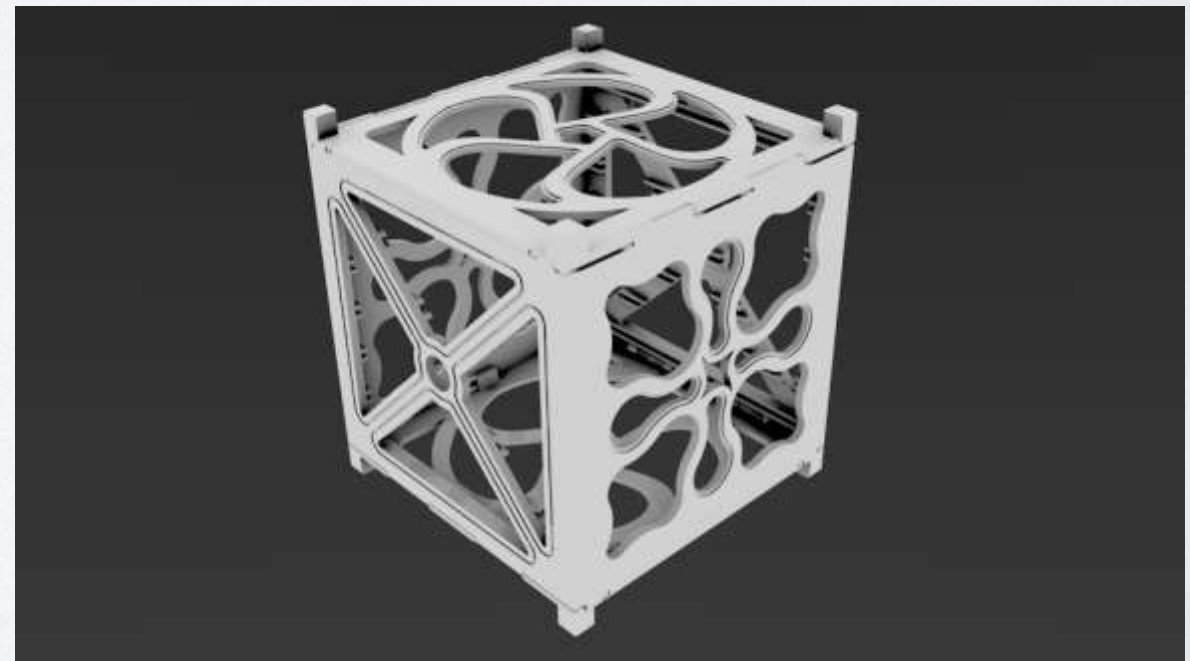
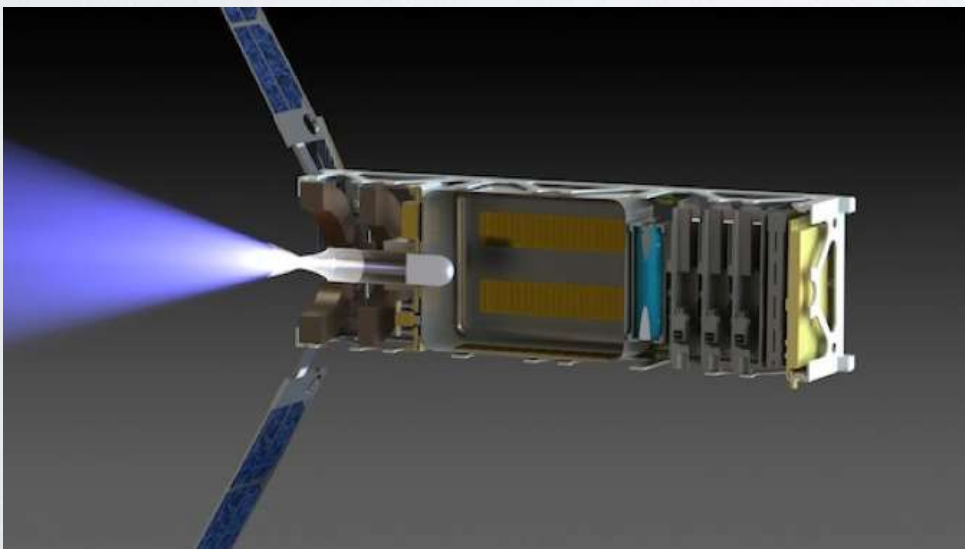
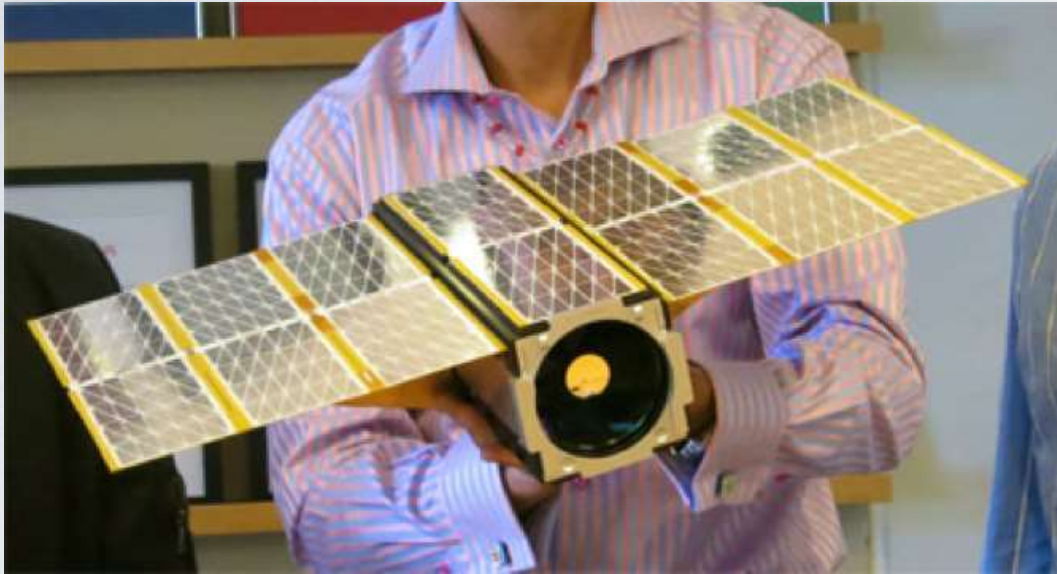


Nové technológie



Astrofyzika/Heliofyzika

TECHNOLÓGIE

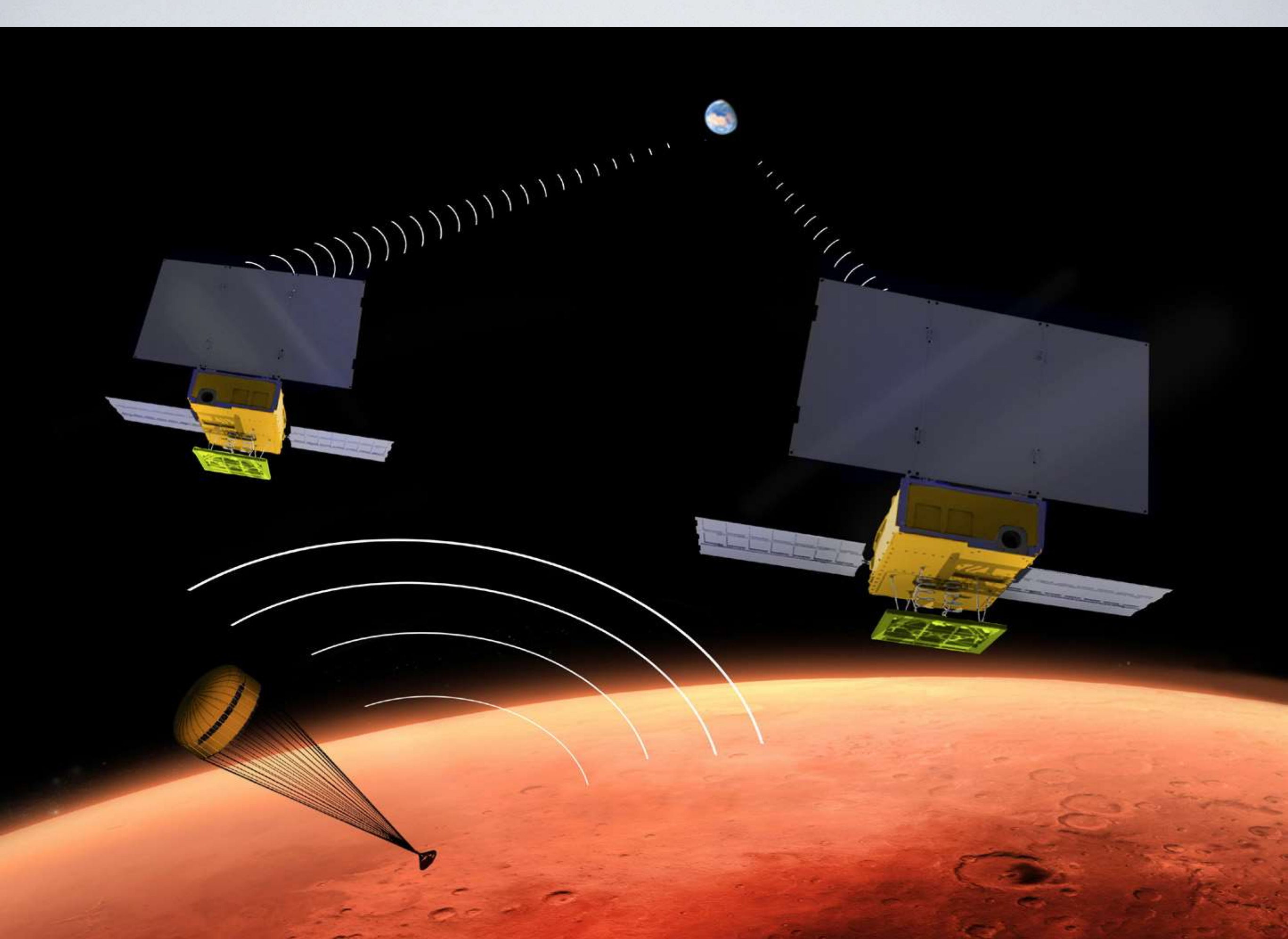


JEDNOTNÝ BUS



MARCO





VIDEO

- https://www.youtube.com/watch?v=dS_Q7BFGuu0

POHON

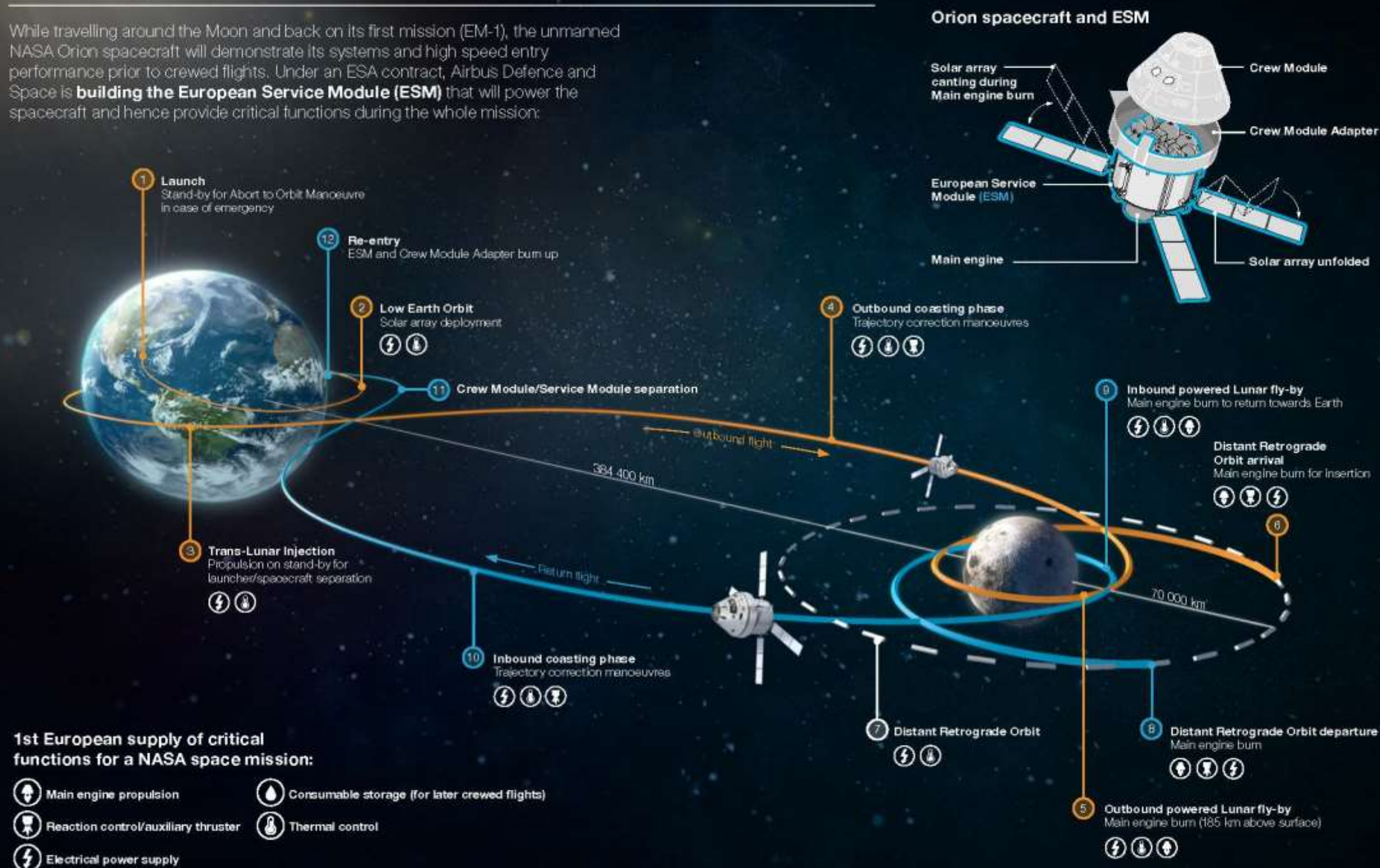
- 755 N-Sec
- Hmotnost' 3490g



SLS EM-1

Journey around the Moon powered by Airbus DS

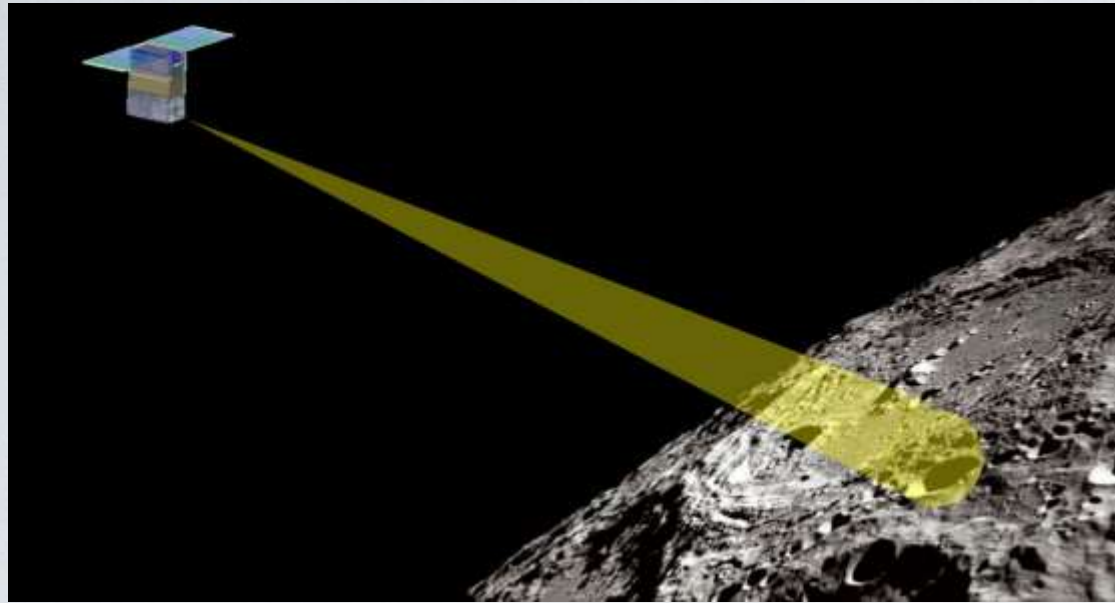
While travelling around the Moon and back on its first mission (EM-1), the unmanned NASA Orion spacecraft will demonstrate its systems and high speed entry performance prior to crewed flights. Under an ESA contract, Airbus Defence and Space is **building the European Service Module (ESM)** that will power the spacecraft and hence provide critical functions during the whole mission:



SLS EM-1

- 13 cubesatov – overenie technológií, vedecký výskum





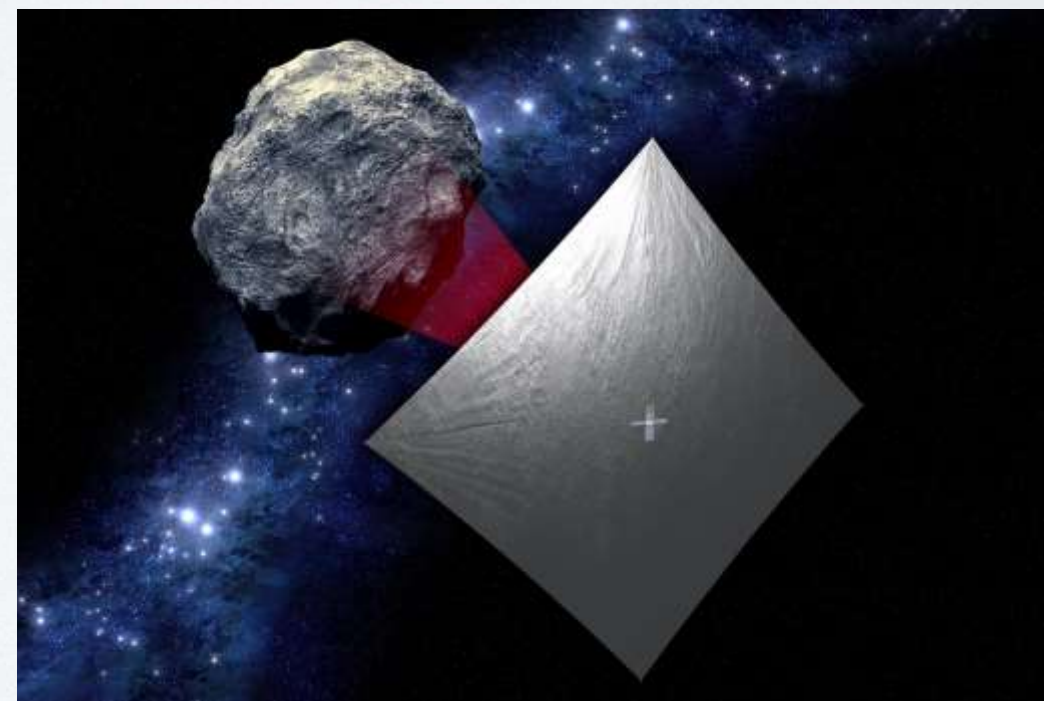
SkyFire



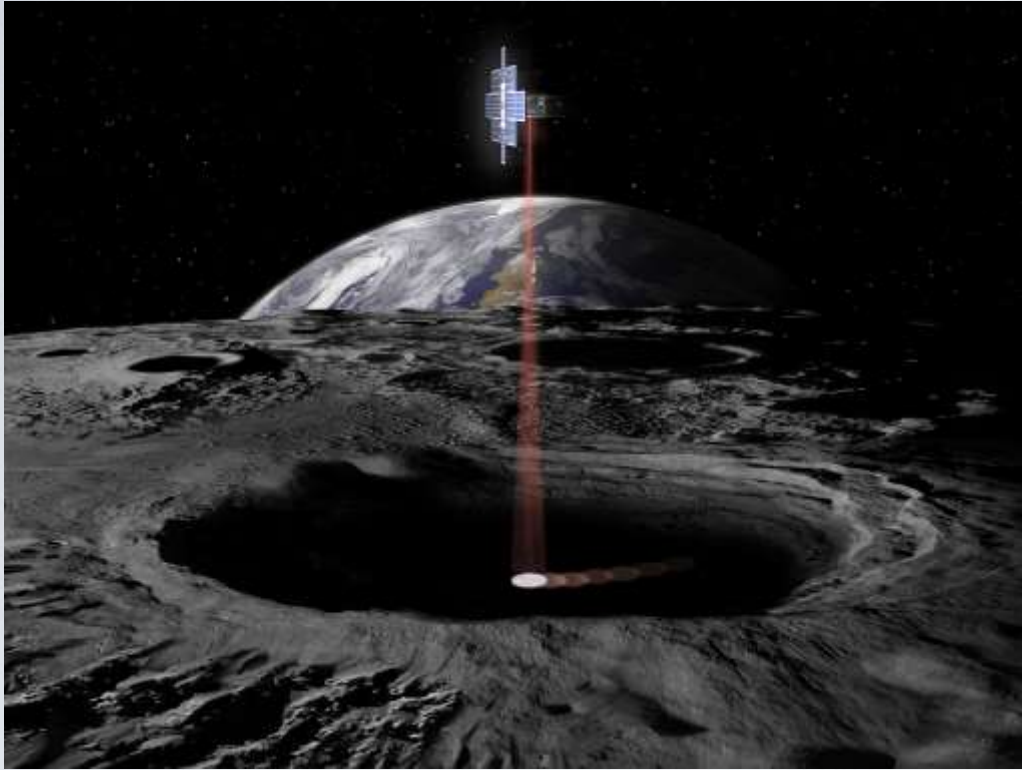
Lunar IceCube



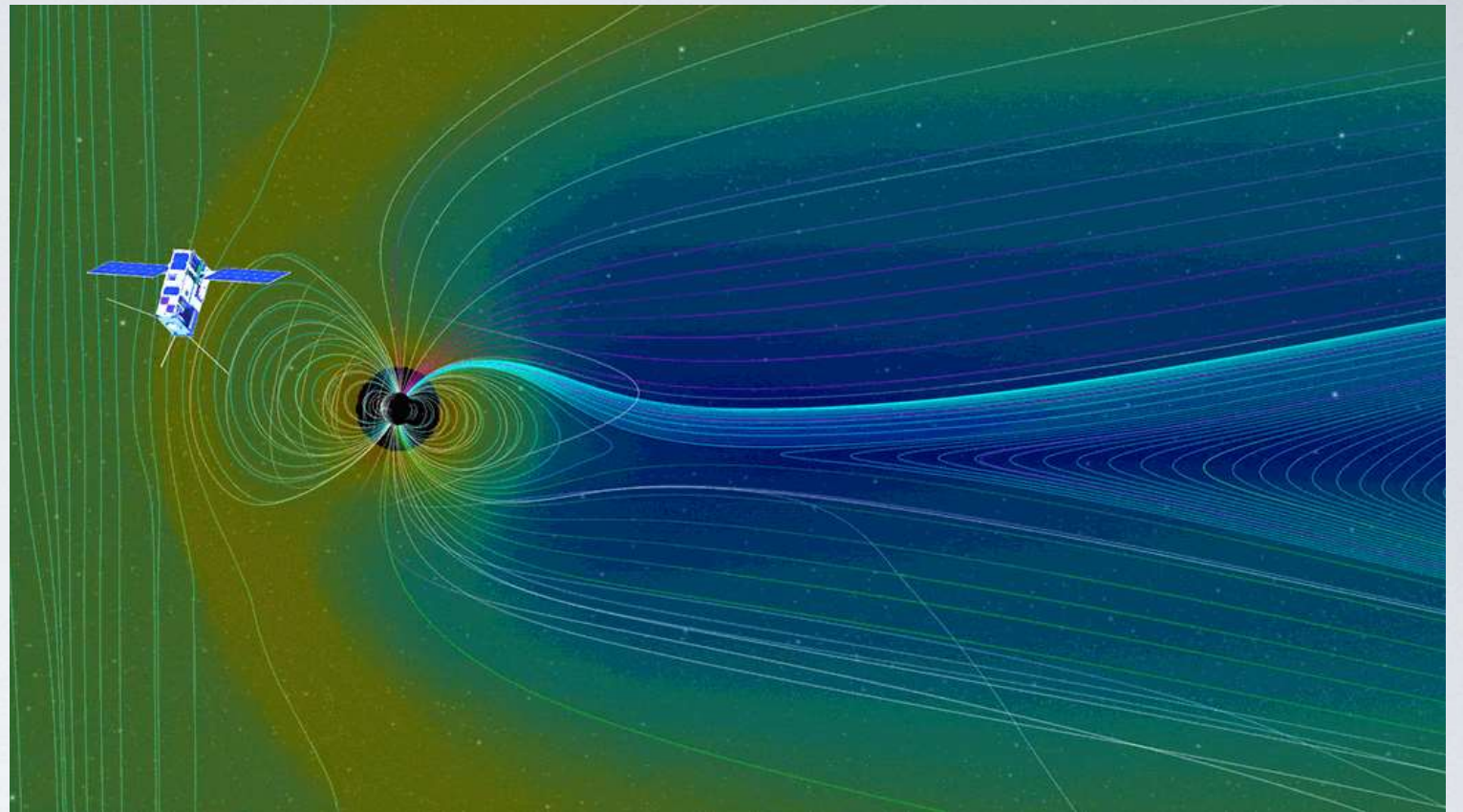
BioSentinel



NEA Scout



Lunar FlashLight



CuSP



LunaH-Map



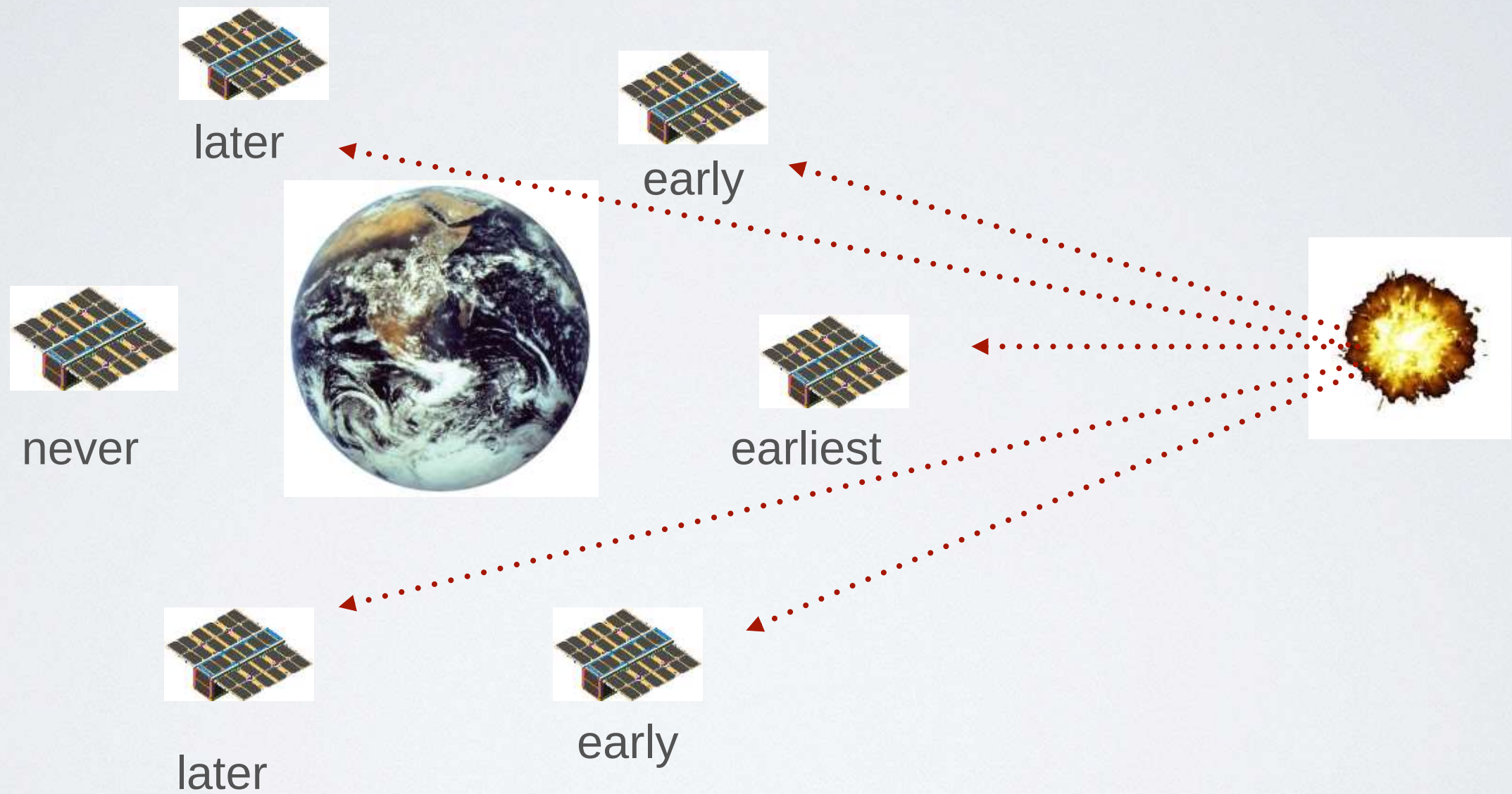
aim

PLÁNY SOSA

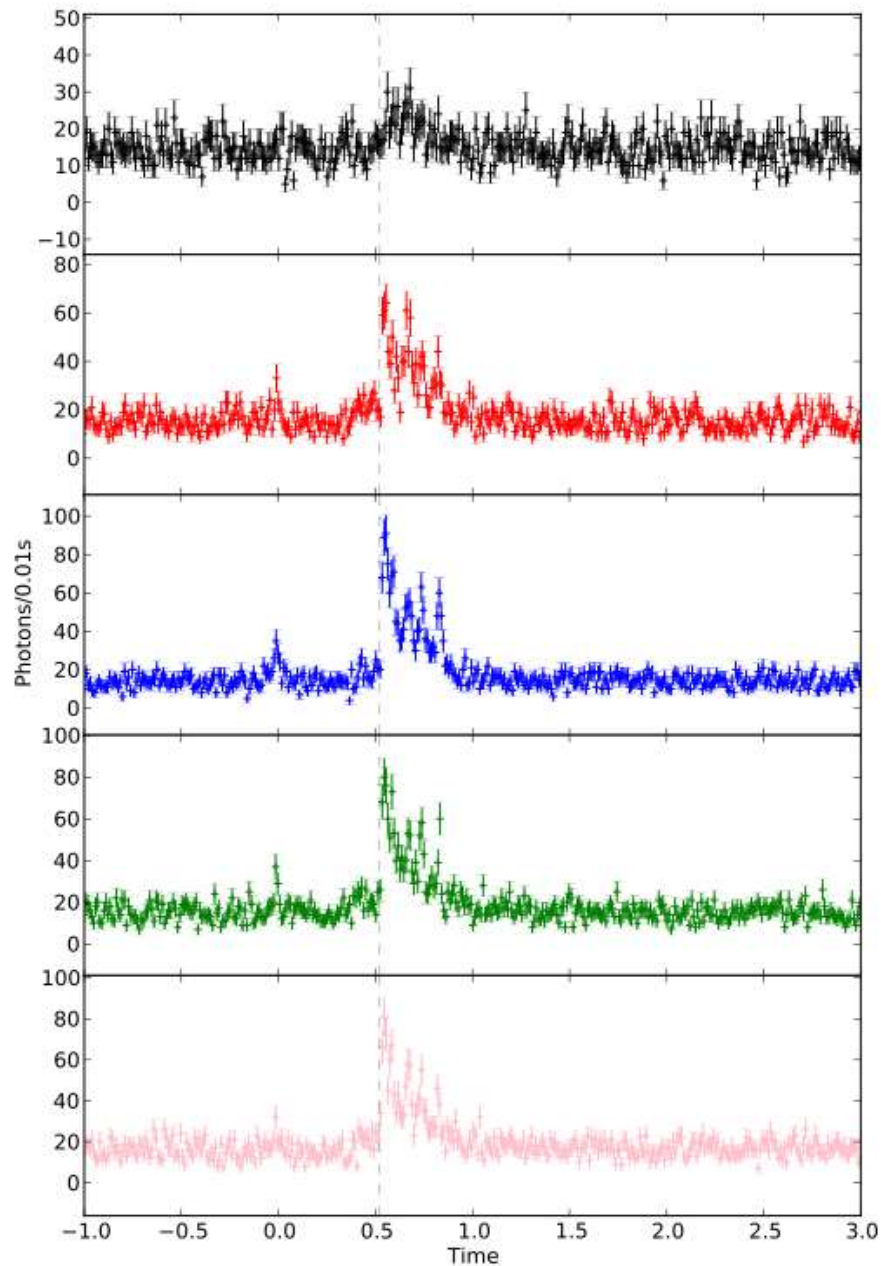
- ARDEA
- Strato-aktivty
- GALILEO
- Medzinárodná spolupráca



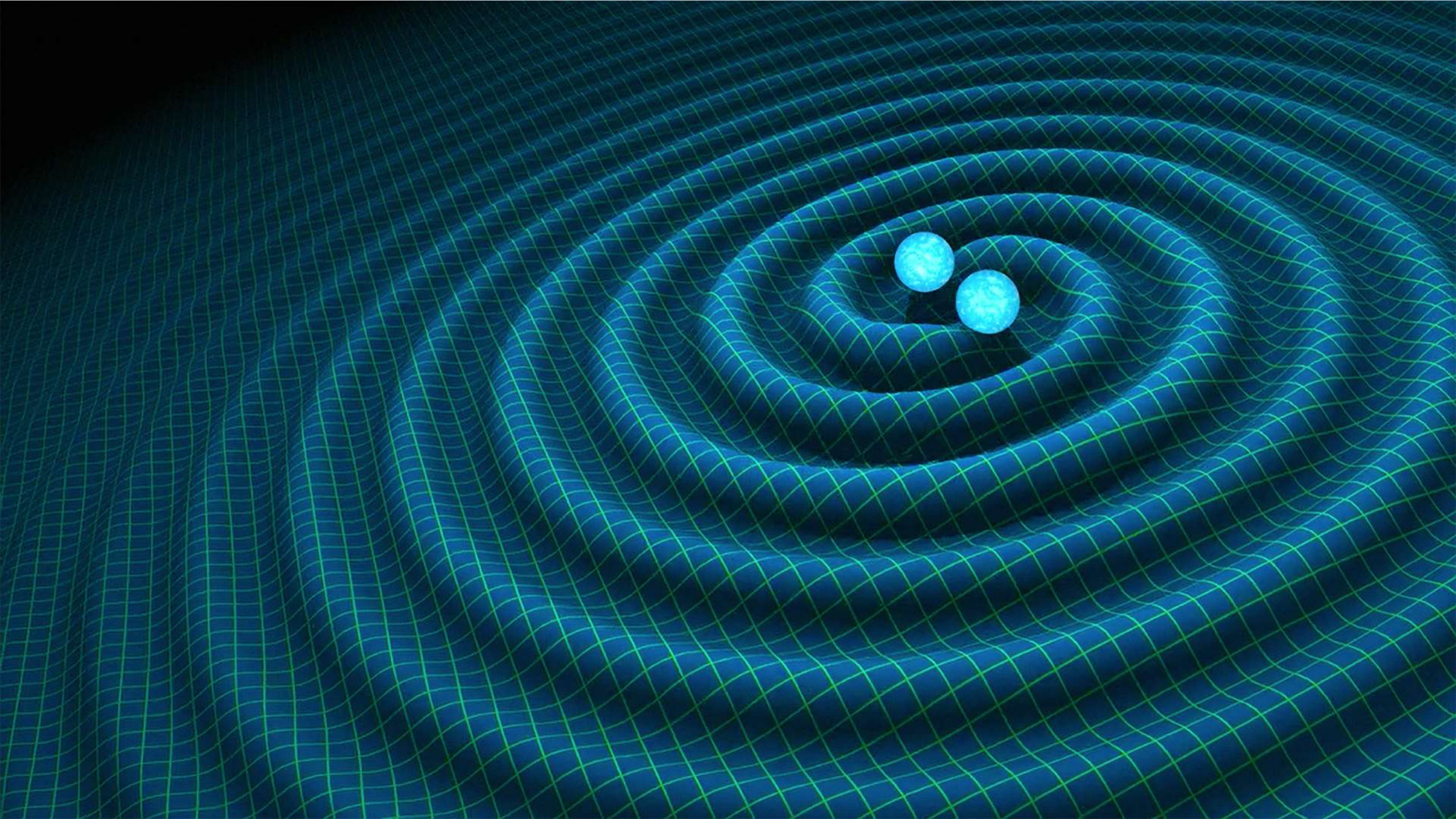
GRB OBSERVATIONS WITH NANO-SATELLITES



GRB OBSERVATIONS WITH NANO-SATELLITES



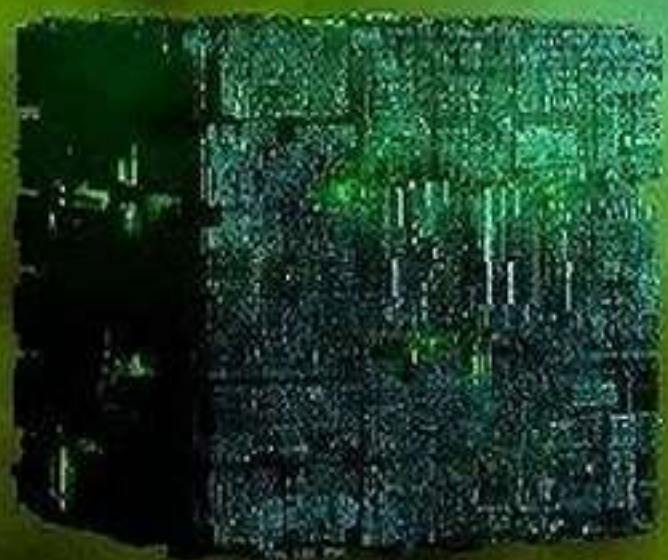
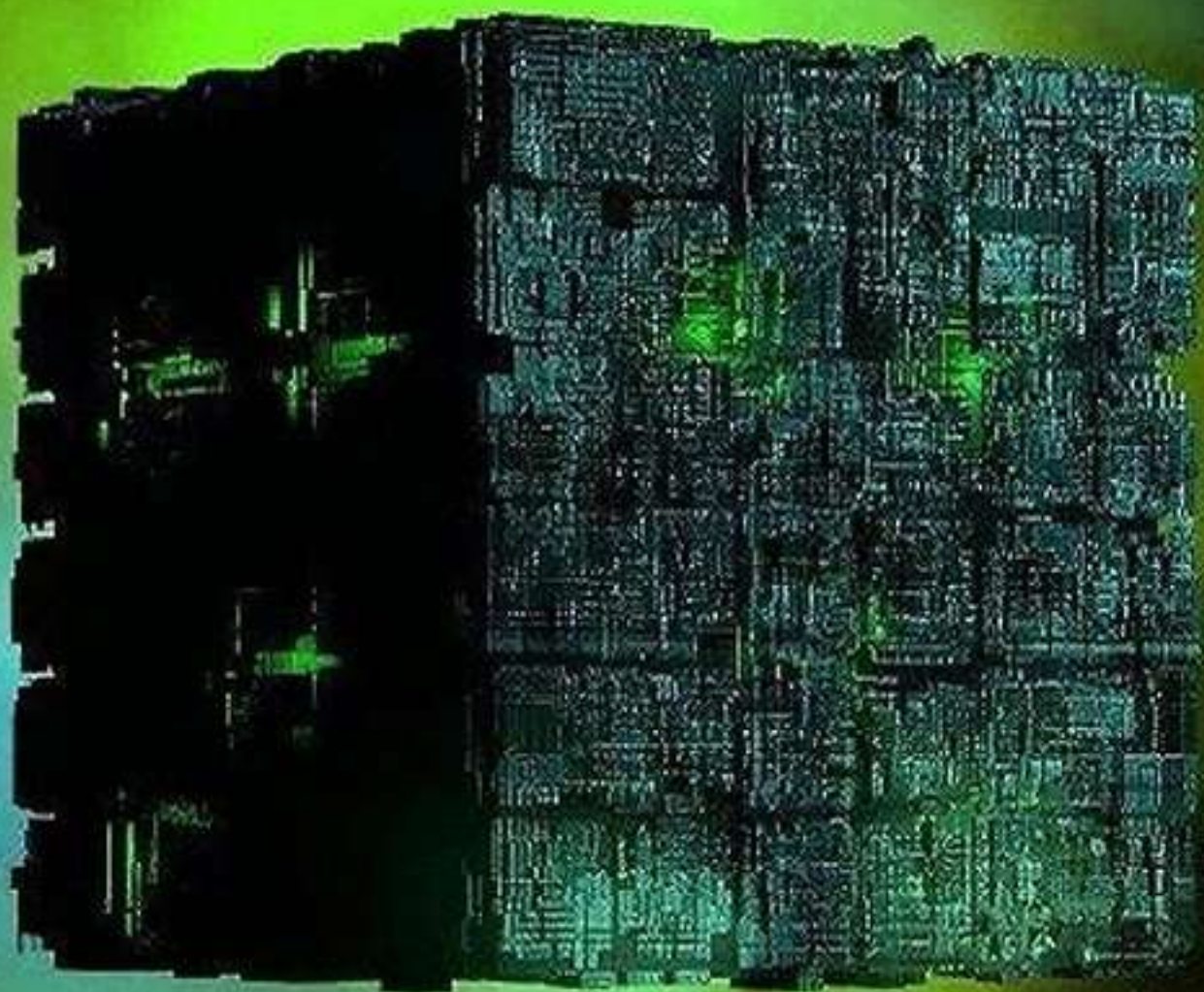
- Rovnaký GRB zachytený viacerými satelitmi
- Synchronizácia pomocou GPS
- Použitie triangulácie pre určenie polohy GRB



- Fermi **\$690 mil.**
- GRB SWARM
6 – 10 cubesatov =

10 mil. EURO







ĎAKUJEM ZA POZORNOST!