

Moderní technologie a bezpečnost

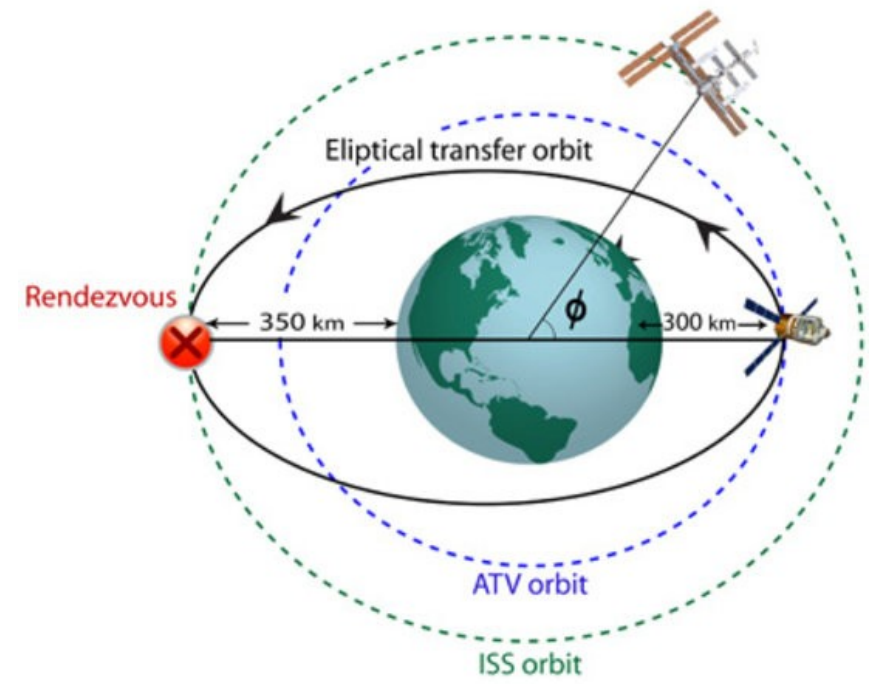
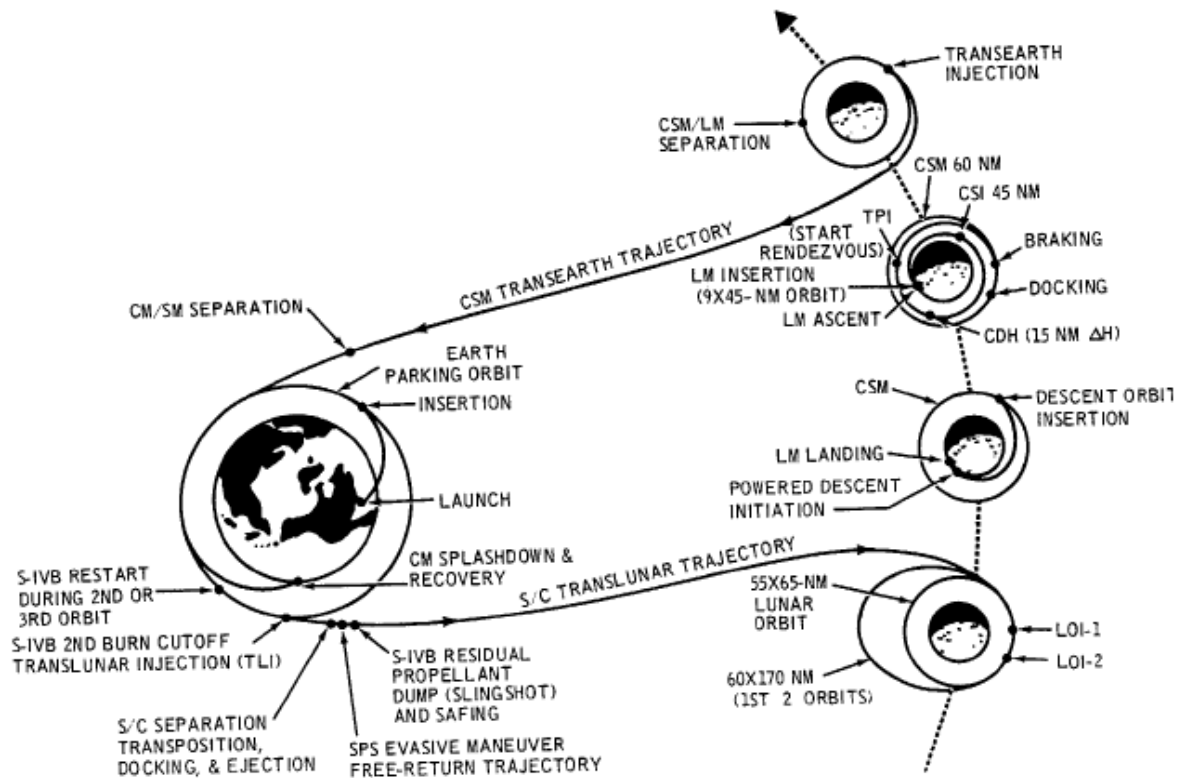
Vesmír



17.10.2022

Marek Dvořáček





- Neil Armstrong and Buzz Aldrin
- Pete Conrad, Alan Bean,
- Alan Shepard, Edgar Mitchell,
- David Scott, James Irwin,
- John Young, Charles Duke,
- Eugene Cernan, Harrison Schmitt





Expedition 68 mission patch



| Mission | Launch date (NET) | Spacecraft | Type | Launch vehicle | Launch site | Launch provider | Docking/berthing port |
|----------------|---|---------------------------------|----------|---------------------|--------------------------|---------------------------|----------------------------------|
| Progress MS-21 | 26 October 2022 ^[277] ^[278] | Progress MS No. 451 | Uncrewed | Soyuz-2.1a | 🇷🇺 Baikonur Site 31/6 | 🇷🇺 Roscosmos | <i>Poisk</i> zenith |
| | | | Module | | | | |
| NG-18 | 6 November 2022 ^[277] ^[279] | S.S Sally Ride | Uncrewed | Antares 230+ | 🇺🇸 Wallops Pad OA | 🇺🇸 Northrop Grumman | <i>Unity</i> nadir |
| SpX-26 | 18 November 2022 ^[277] ^[279] | Cargo Dragon C211 | Uncrewed | Falcon 9 Block 5 | 🇺🇸 Kennedy LC-39A | 🇺🇸 SpaceX | <i>Harmony</i> zenith |
| | | | Module | | | | |
| SpX-27 | 10 January 2023 ^[277] ^[279] | Cargo Dragon | Uncrewed | Falcon 9 Block 5 | 🇺🇸 Kennedy LC-39A | 🇺🇸 SpaceX | <i>Harmony</i> zenith |
| | | | Module | | | | |
| Boe-CFT | February 2023 ^[280] ^[277] ^[279] ^[281] | Boeing Starliner <i>Calypso</i> | Crewed | Atlas V N22 | 🇺🇸 Cape Canaveral SLC-41 | 🇺🇸 United Launch Alliance | <i>Harmony</i> forward |
| AX-2 | Q1 2023 | Crew Dragon | Crewed | Falcon 9 Block 5 | 🇺🇸 Kennedy LC-39A | 🇺🇸 SpaceX | <i>Harmony</i> forward or zenith |
| HTV-X1 | Q2 2023 ^[277] | HTV-X | Uncrewed | H3-24L | 🇯🇵 Tanegashima LA-Y2 | 🇯🇵 JAXA | <i>Harmony</i> nadir |
| Progress MS-22 | 20 February 2023 ^[277] ^[278] | Progress MS No. 452 | Uncrewed | Soyuz-2.1a | 🇷🇺 Baikonur Site 31/6 | 🇷🇺 Roscosmos | <i>Zvezda</i> aft |
| NG-19 | February 2023 ^[277] ^[279] | Cygnus | Uncrewed | Antares 230+ | 🇺🇸 Wallops Pad OA | 🇺🇸 Northrop Grumman | <i>Unity</i> nadir |
| SNC-1 | February 2023 ^[277] ^[279] ^[282] | Dream Chaser <i>Tenacity</i> | Uncrewed | Vulcan Centaur VC4L | 🇺🇸 Cape Canaveral SLC-41 | 🇺🇸 United Launch Alliance | <i>Harmony</i> nadir |
| Soyuz MS-23 | 20 March 2023 | Soyuz MS | Crewed | Soyuz-2.1a | 🇷🇺 Baikonur Site 31/6 | 🇷🇺 Roscosmos | <i>Prichal</i> nadir |
| SpaceX Crew-6 | March 2023 | Dragon 2 Endeavour}} | Crewed | Falcon 9 Block 5 | 🇺🇸 Kennedy LC-39A | 🇺🇸 SpaceX | <i>Harmony</i> forward or zenith |
| AX-3 | H1 2023 | Crew Dragon | Crewed | Falcon 9 Block 5 | 🇺🇸 Kennedy LC-39A | 🇺🇸 SpaceX | <i>Harmony</i> forward or zenith |
| HTV-X2 | April 2023 ^[277] | HTV-X | Uncrewed | H3-24L | 🇯🇵 Tanegashima LA-Y2 | 🇯🇵 JAXA | <i>Harmony</i> nadir |
| SpX-28 | 5 June 2023 ^[277] ^[279] | Cargo Dragon | Uncrewed | Falcon 9 Block 5 | 🇺🇸 Kennedy LC-39A | 🇺🇸 SpaceX | <i>Harmony</i> zenith |
| Progress MS-23 | 20 February 2022 ^[277] ^[278] | Progress MS No. 453 | Uncrewed | Soyuz-2.1a | 🇷🇺 Baikonur Site 31/6 | 🇷🇺 Roscosmos | <i>Poisk</i> zenith |
| Soyuz MS-24 | 21 September 2023 | Soyuz MS | Crewed | Soyuz-2.1a | 🇷🇺 Baikonur Site 31/6 | 🇷🇺 Roscosmos | <i>Rassvet</i> nadir |
| Starliner-1 | September 2023 ^[277] ^[279] | Boeing Starliner SC-2 | Crewed | Atlas V N22 | 🇺🇸 Cape Canaveral SLC-41 | 🇺🇸 United Launch Alliance | <i>Harmony</i> forward |



ned)

Soyu



Home » Astronomy & Space » Space Exploration » May 31, 2017

Space junk could destroy satellites, hurt economies

May 31, 2017



There are an estimated 170 as small as paint flakes — ir

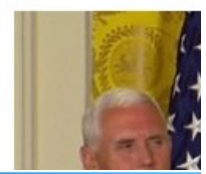


NEWS Home Video Wor

US & Canada

Trump sp military b

18 June 2018



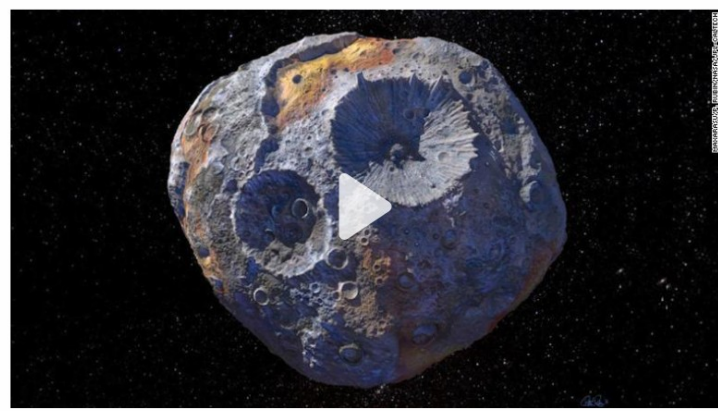
News Sport Weather Shop Earth Travel Mor

CNN US Crime + Justice Energy + Environment Extreme Weather Space + Science

Psyche, an asteroid believed to be worth \$10,000 quadrillion, is observed through Hubble Telescope in new study

By Francesca Giuliani-Hoffman, CNN

Updated 0354 GMT (1154 HKT) November 2, 2020



An asteroid in space possibly worth more than the entire economy of our planet 01:23

(CNN) — A rare metallic asteroid about three times farther away from the sun than our planet could yield secrets about Earth's molten core, and scientists want to learn all about it.

A new study published Monday in The Planetary Science Journal takes a closer look at this mysterious asteroid, using data from the Hubble Telescope.

Located between Mars and Jupiter, Asteroid 16 Psyche is one of the most massive objects in the



China and Russia could cripple the US with a space attack, but the US is pushing back

VOLBY SENÁTNÍ VOLBY DOMÁCÍ SVĚT REGIONY

esmír. Spojené státy složku armády pro

Asia Australia Middle East Africa Inequality Cities Global development

Security row over EU Galileo satellite project as Britain is shut out

Fears over impact on Brexit talks with UK taxpayers having already contributed £1bn



The Ariane 5 rocket with a payload of four Galileo satellites lifts off from ESA's European Spaceport in Kourou, French Guiana last year. Photograph: S. Martin/AFP/Getty Images

A fresh row over the UK's involvement with the Galileo satellite programme, to which the country's taxpayers have already paid £1bn, threatens to poison the Brexit talks after the EU shut Britain out of the project.

A majority of member states have turned against the UK and voted in favour of pushing forward on the next round of contracts for the £8bn project, despite requests for a delay to allow negotiations over British involvement to progress. UK firms are being blocked from bidding for contracts.

- most viewed
 - Live Lewis Hamilton wins the Russian Grand Prix - as it happened
 - Live Ryder Cup 2018: Europe 10.5-8.5 USA - Sunday singles live!
 - Indonesia tsunami: death toll could reach thousands, officials say
 - Live Tsunami in Indonesia: death toll at 832 and expected to rise sharply - live updates
 - Trump professes love for Kim and hate for Kavanaugh torment in freewheeling speech



K dopadení podezřelých z Kuciaka pomohly snímky americké družice, píše Re

AKTUALIZOVÁNO Před 2 hodinami

Slovenská policie zatkla osm osob podezřelých z vraždy novináře Jána Kuciaka a jeho přítelkyně, ve čtvrtek ráno o tom informoval slovenský Denník N.



bez pekelných poplatků

Equa bank

Otevřít účet online

SPACE

Satellite operator Viasat climbs 27% after selling military communications unit to L3Harris for \$2 billion

PUBLISHED MON, OCT 3 2022-11:20 AM EDT | UPDATED MON, OCT 3 2022-4:07 PM EDT

Michael Sheetz @THESHEETZTWEETZ

SHARE f t in e

- KEY POINTS**
- California-based satellite operator business to defense contractor L3Harris
 - Viasat is selling its "Link 16 Tactical Communications System" that connects ships, aircraft and submarines through a secured voice and data link

GAO: Defense, intelligence agencies need a better plan to buy commercial satellite imagery

by Sandra Erwin — September 7, 2022



Satellite image collected by BlackSky over Vasylykiv Air Base, Ukraine, Feb. 28. Credit: BlackSky

GAO director Brian Mazanec: 'Commercial satellite capabilities are increasingly going to be indispensable to the national security enterprise'

ORGANIZATION | TOPICS |

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NATO's over...

17 Jan. 2022 - | Last updated: 1

English | French

SPACE NEWS

As DoD grows more reliant on the relationship

by Sandra Erwin — September 22, 2022

DoD and the intelligence community would use commercial space



ORGANIZATION | TOPICS |

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NATO's over...

17 Jan. 2022 - | Last updated: 1

English | French

Exclusive: Musk's SpaceX says it can no longer pay for critical satellite services in Ukraine, asks the tab

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as Iran of jamming its

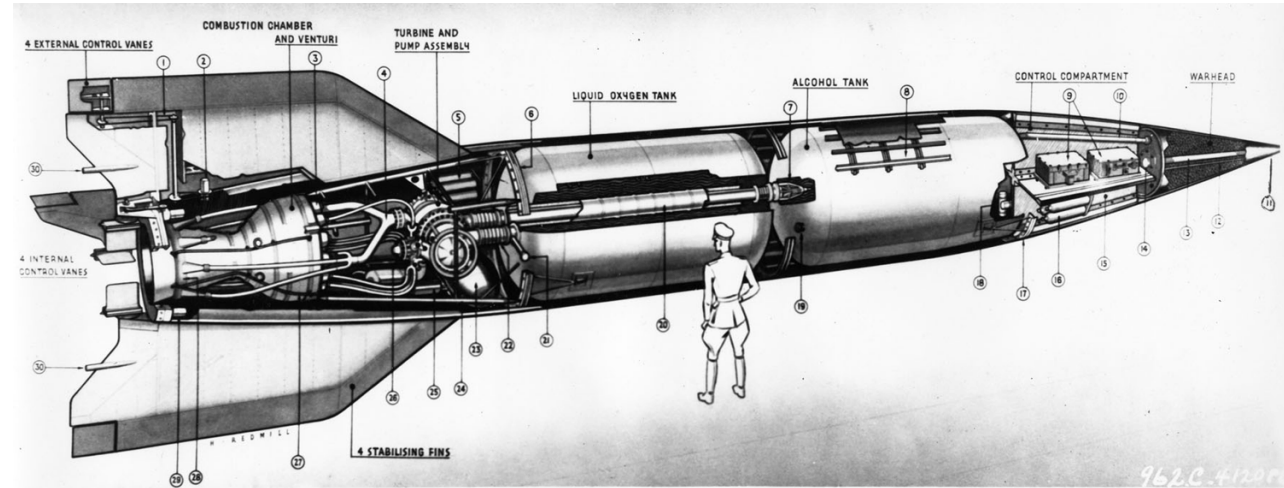


- 1) vesmír a Kármánova linie

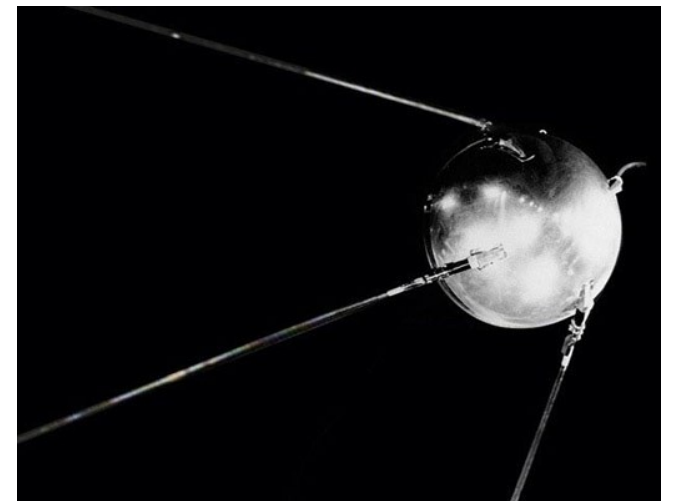
- atmosférický bod ve výšce 100 km
- pro běžné letectví nejvyšším dosažitelným bodem
- pro vesmírné plavidlo je to nejnižší bod, pod nímž je atmosféra příliš hustá na to, aby mohlo setrvat na stabilní orbitě bez kontinuálního tahu svého pohonu

2) historie – 1942 a 1957

- Vergeltungswaffe 2



- Sputnik-1



Satellite

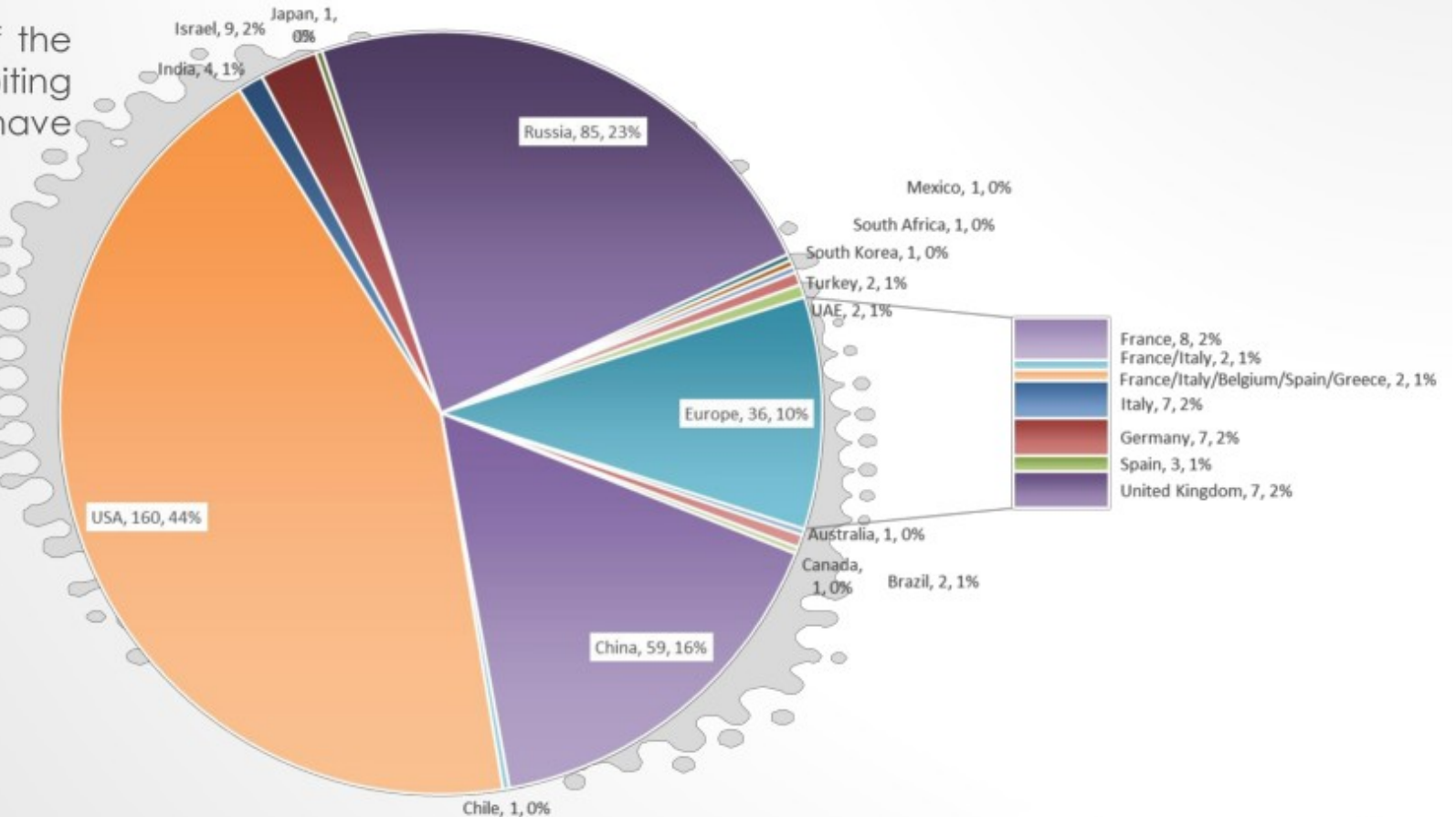
NATIONAL DEFENCE SATELLITES

Approximately 366 satellites of the 1,738 satellites currently orbiting Earth (as at 31 August 2017) have some form of military user.

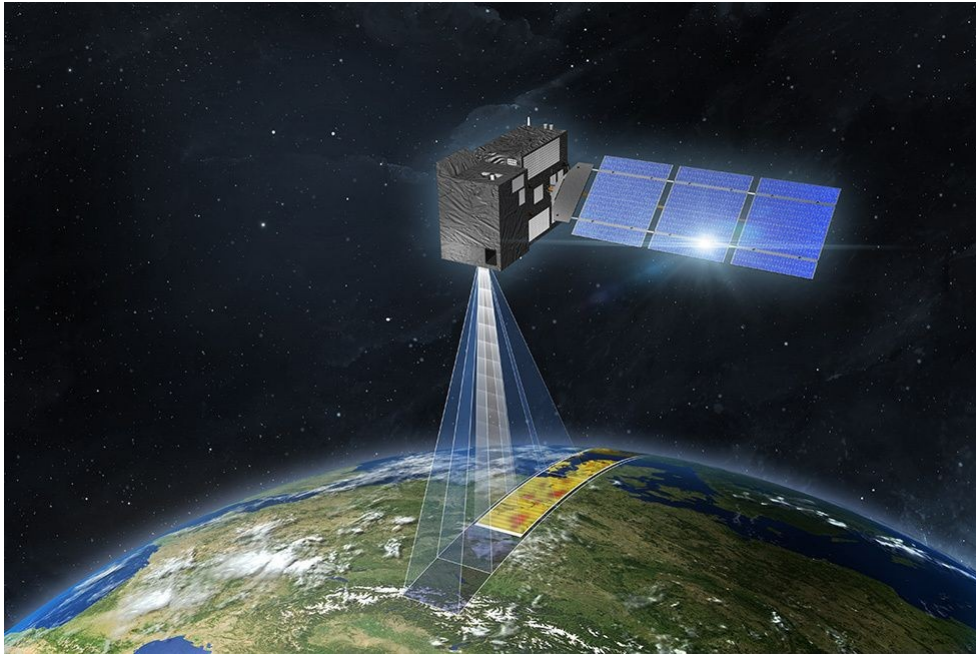
US: 30.6% Remote Sensing (49)
27.5% Communications (44)
19.4% Navigation (31)
17.5% Technology (28)
3.1% Space Observation (5)
1.9% Space Science (3)

Russia: 50.6% Communications (43)
31.8% Navigation (27)
11.8% Remote Sensing (10)
2.4% Space Observation (2)
2.4% Technology (2)
1.2% Earth Science (1)

China: 50.8% Remote Sensing (30)
37.3% Navigation (22)
6.8% Communication (4)
3.4% Technology (2)
1.7% Earth Science (1)



Satellite



REPORTS & MULTIMEDIA / FEATURE

UCS Satellite Database

In-depth details on the 5,465 satellites currently orbiting Earth, including their country of origin, purpose, and other operational details.

Published Dec 8, 2005 | Updated May 1, 2022

Satellite quick facts

Includes launches through 4/30/2022

- **Total number of operating satellites: 5,465**
 - United States: 3,433
 - Russia: 172
 - China: 541
 - Other: 1,319
- LEO: 4,700
- MEO: 140
- Elliptical: 60
- GEO: 565
- **Total number of US satellites: 3,434**
 - Civil: 31
 - Commercial: 2,992
 - Government: 172
 - Military: 237

GeoInt

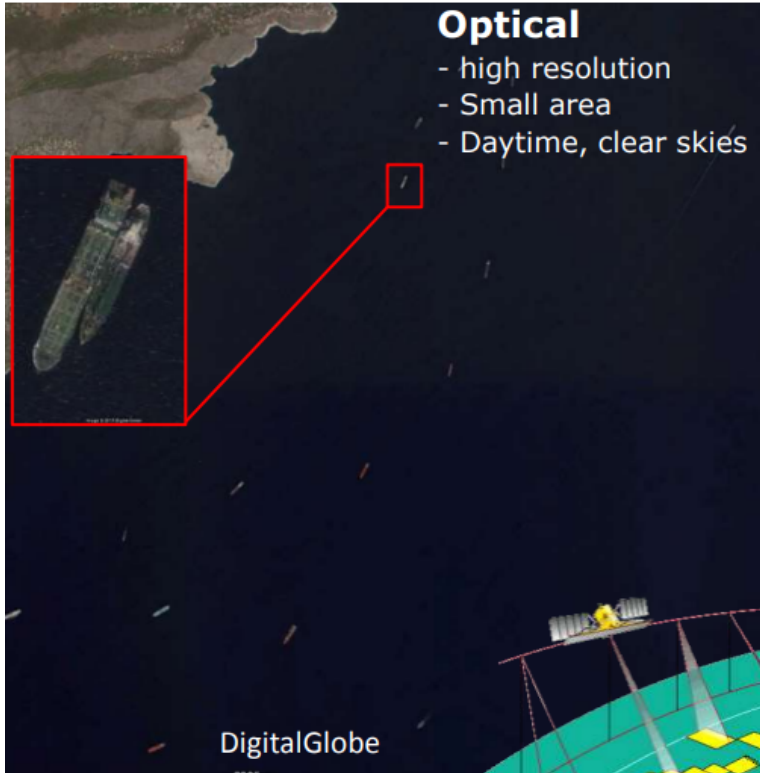
| Služby | Využití NATO a efekt | Národní a komerční systémy |
|--|---|---|
| Poziční, navigační a časová | <ul style="list-style-type: none"> • Přesné údery • Navigace síly • Podpora pátrací a záchranné služby • Časování sítí | GPS Galileo |
| Integrované taktické varování a posouzení hrozeb | <ul style="list-style-type: none"> • Ochrana sil • Přisouzení vážnosti hrozeb • Protiraketová obrana | Space Based Infrared System |
| Monitoring prostředí | <ul style="list-style-type: none"> • Plánování misí • Výběr munice • Předpověď počasí | EUMETSAT Obranný meteorologický satelitní program |
| Komunikace | <ul style="list-style-type: none"> • Kontrola a řízení • Autonomní systémy • Nasazená komunikace | GBS Syracuse EUTELSAT SICRAL SKYNET INTELSAT |
| Zpravodajství, dohled a průzkum | <ul style="list-style-type: none"> • Pokrytí pro výkon operací (v operačním středisku) • Vyhodnocení bojových škod • Zpravodajství • Cílování | SAR Lupe COSMO SKYMED HELIOSIKONOS |
| Identifikace | <ul style="list-style-type: none"> • Automatická identifikace | AIS |



Earth observation satellites



→ Used for **recognition**



→ Used for **detection**

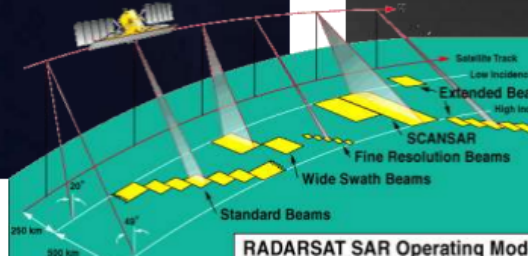
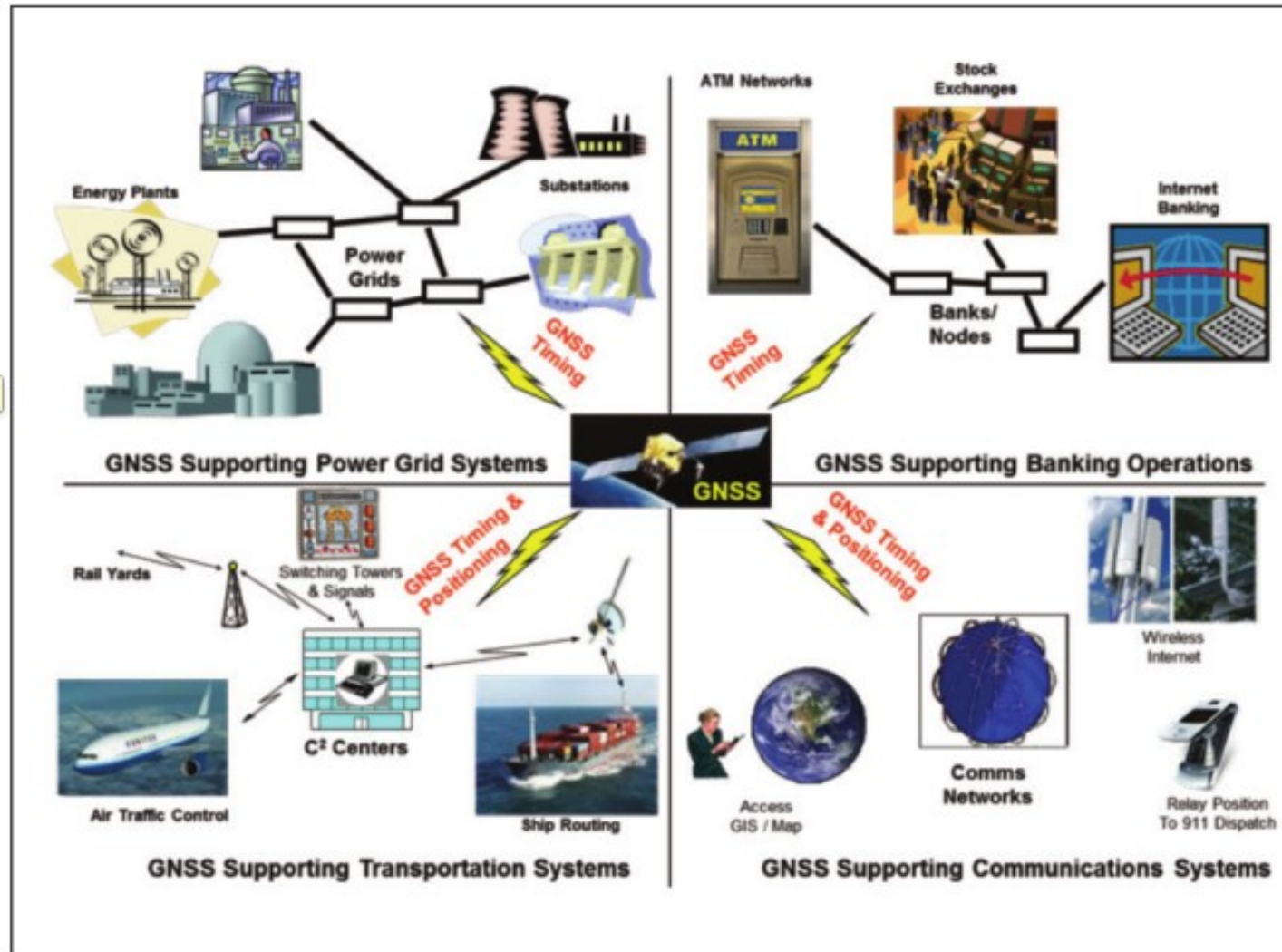
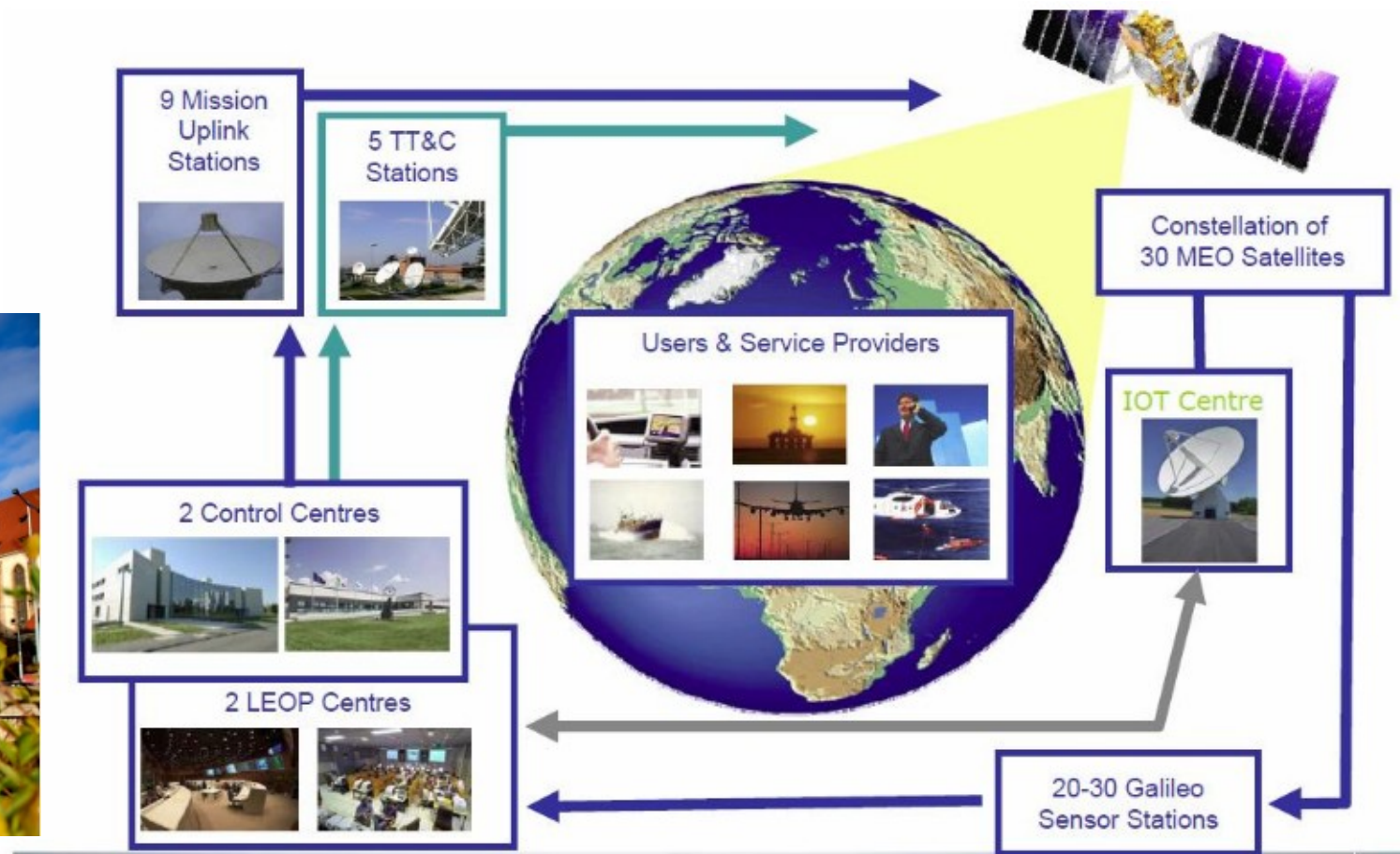


Figure 5: Today's reliance on GNSS positioning and timing signals





Vesmírná bezpečnost:

„Bezpečný a udržitelný přístup k vesmíru a jeho využívání, jakož i svoboda od hrozeb vycházejících z prostoru.“

- definice vychází z principů v Kosmické smlouvě z roku 1967
- vesmír má zůstat volně dostupný pro všechny k mírovému využití nyní i do budoucna

- Clay Moltz:

vesmírná bezpečnost jako schopnost vynášet a operovat se satelity mimo zemskou atmosféru bez externího rušení, poškozování nebo destrukce

- Tři dimenze vesmírné bezpečnosti shrnuje Jean-François Mayence

Tři dimenze

- Kosmický prostor pro bezpečnost:

užití vesmírných systémů pro bezpečnostní a obranné účely

- Bezpečnost ve vesmíru:

jak chránit vesmírné prostředky a systémy před přírodními a/nebo lidskými hrozbami nebo riziky a zachovat udržitelný rozvoj vesmírných aktivit

- Bezpečnost z vesmíru:

jak chránit lidský život a životní prostředí Země před přírodními hrozbami a riziky z vesmíru

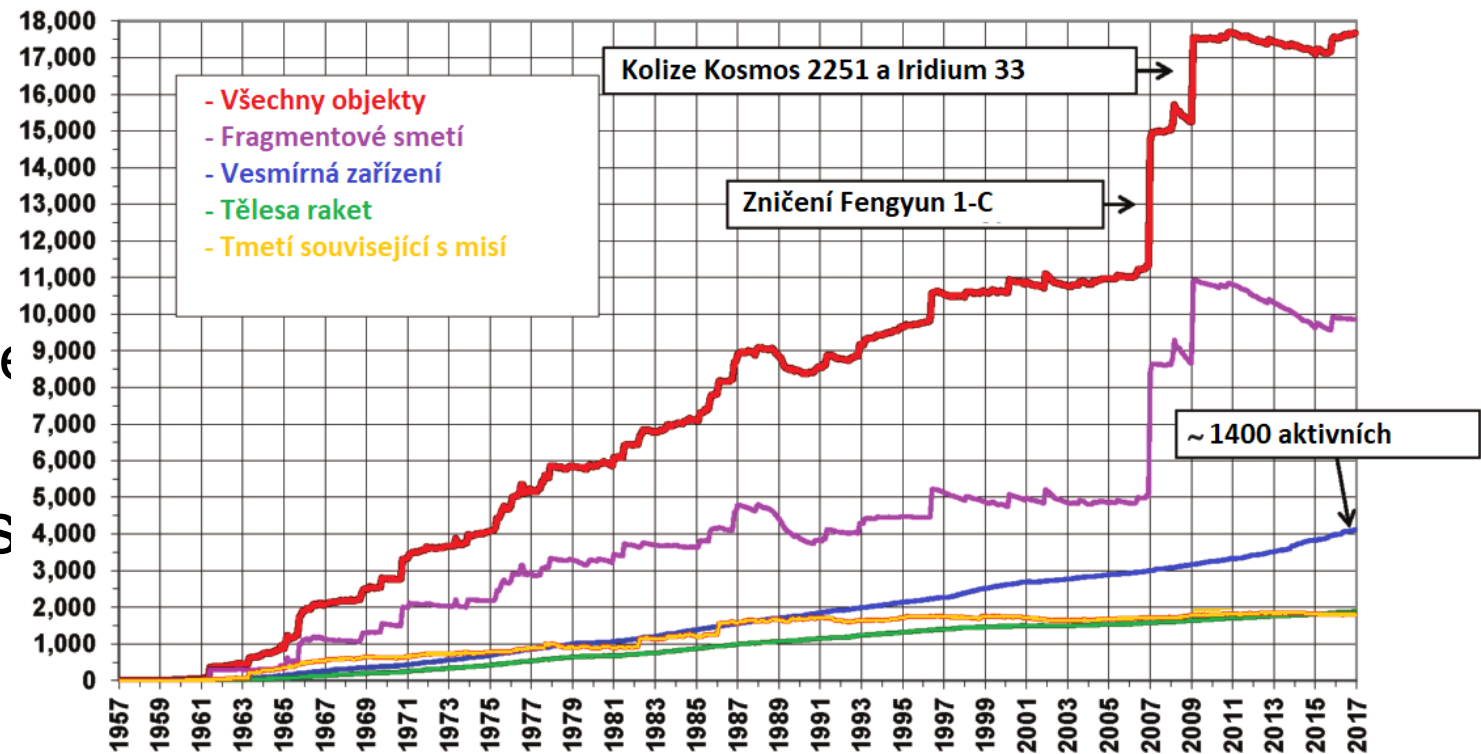
Rizika a hrozby

- Kosmické smetí
 - Kesslerův syndrom – kaskádový nárůst

- Antisatelitní zbraně

- Konvenční
- Jaderné
- Směřované energie - lasery

- Kybernetická bezpečnost



Small LEO space population largely unknown

LEO-crossing (0 to 2000 km) objects
estimated from debris surveys and events

| | | |
|--------|---|-------|
| 167 | > | 5 m |
| 350 | > | 4 m |
| 721 | > | 3 m |
| 1816 | > | 2 m |
| 2879 | > | 1 m |
| 3378 | > | 90 cm |
| 4650 | > | 80 cm |
| 5480 | > | 70 cm |
| 6136 | > | 60 cm |
| 6816 | > | 50 cm |
| 7427 | > | 40 cm |
| 8583 | > | 30 cm |
| 13329 | > | 20 cm |
| 18259 | > | 10 cm |
| 23599 | > | 9 cm |
| 28981 | > | 8 cm |
| 34386 | > | 7 cm |
| 39834 | > | 6 cm |
| 45210 | > | 5 cm |
| 50982 | > | 4 cm |
| 77749 | > | 3 cm |
| 211729 | > | 2 cm |
| 364583 | > | 1 cm |

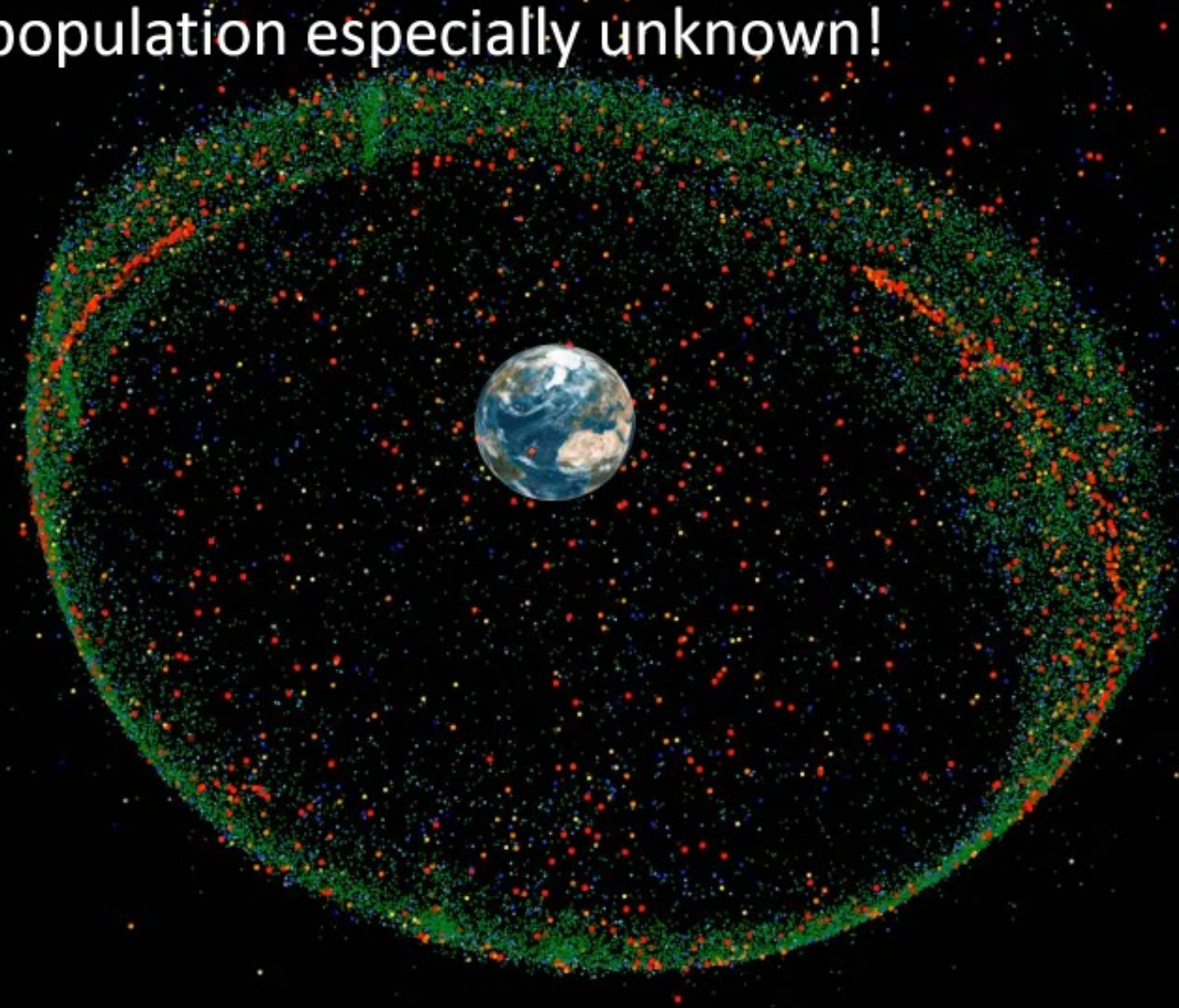
← Today's
public
catalog

Today's current public
catalog contains < 4% of
LEO-crossing objects > 1 cm

Small GEO space population especially unknown!

GEO-crossing ($\text{GEO} \pm 100 \text{ km}$) objects
estimated from debris surveys and events

| | | |
|-------|---|-------|
| 634 | > | 5 m |
| 783 | > | 4 m |
| 960 | > | 3 m |
| 1188 | > | 2 m |
| 1378 | > | 1 m |
| 1406 | > | 90 cm |
| 1434 | > | 80 cm |
| 1479 | > | 70 cm |
| 1512 | > | 60 cm |
| 1557 | > | 50 cm |
| 1600 | > | 40 cm |
| 1660 | > | 30 cm |
| 1912 | > | 20 cm |
| 2179 | > | 10 cm |
| 2677 | > | 9 cm |
| 3143 | > | 8 cm |
| 3630 | > | 7 cm |
| 4120 | > | 6 cm |
| 4570 | > | 5 cm |
| 5118 | > | 4 cm |
| 7190 | > | 3 cm |
| 17687 | > | 2 cm |
| 33239 | > | 1 cm |

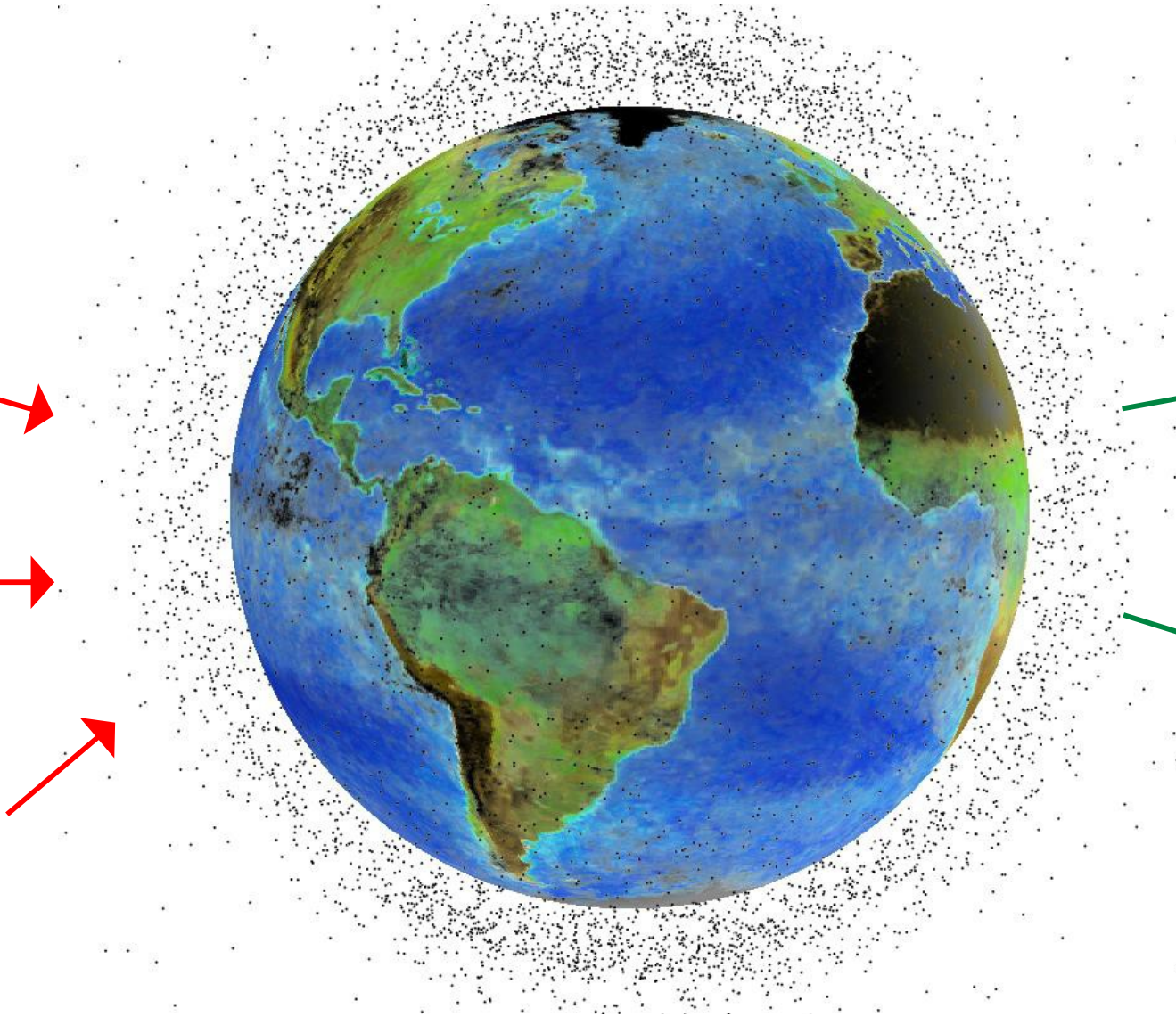


Sources

Launches (rocket bodies, payloads, mission related objects)

Fragmentations (explosions, collisions)

Non-fragmentation debris (surface degradation, solid rocket motor particles)



Sinks

Natural decay (atmospheric drag, solar radiation pressure, lunisolar perturbations)

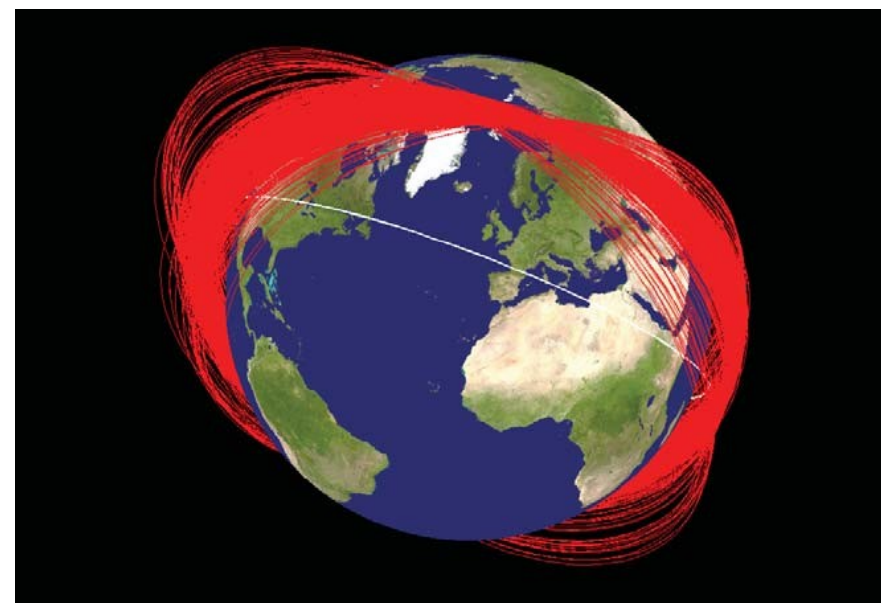
Active Removal (de-orbit, non-propulsive maneuvers)



Starfish Prime
1962



SM-3 raketa
2008



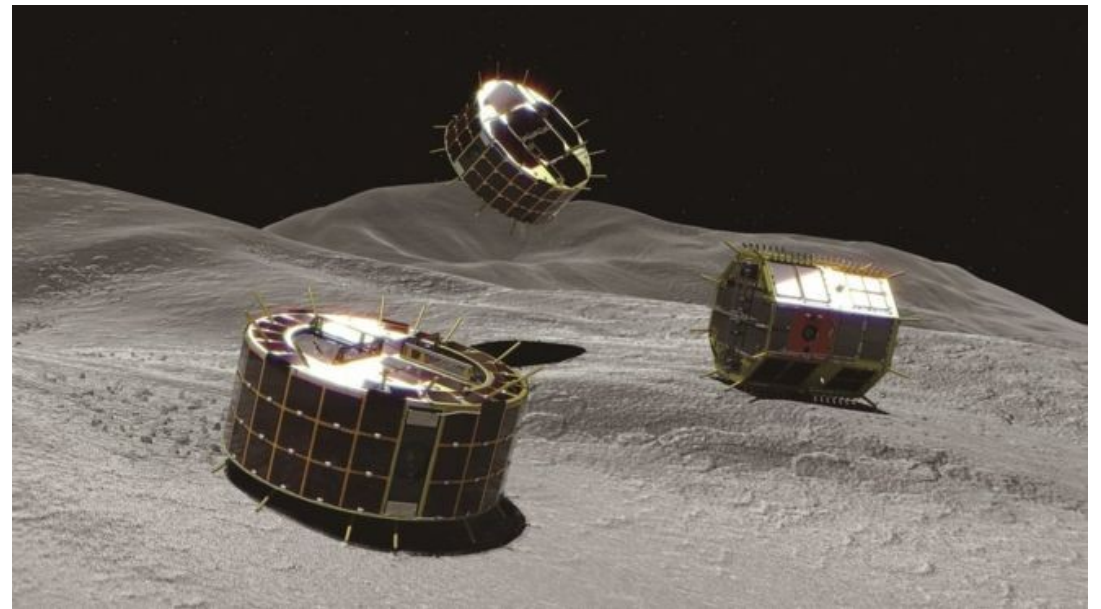
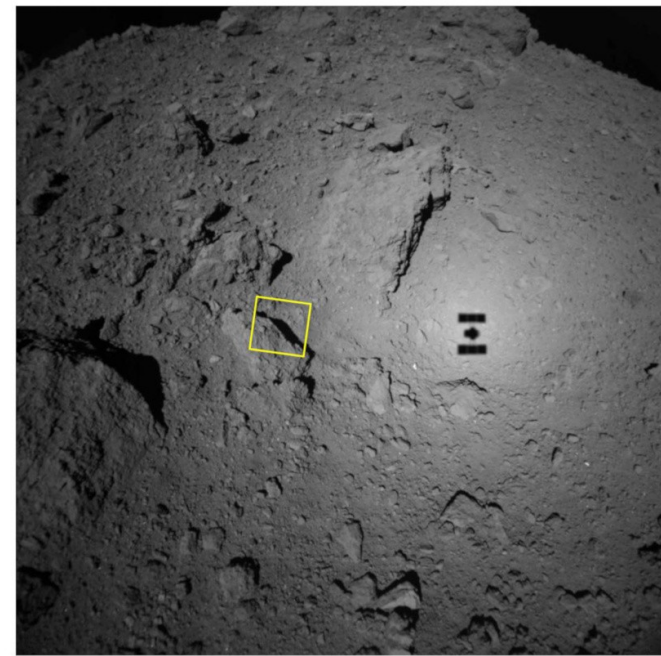
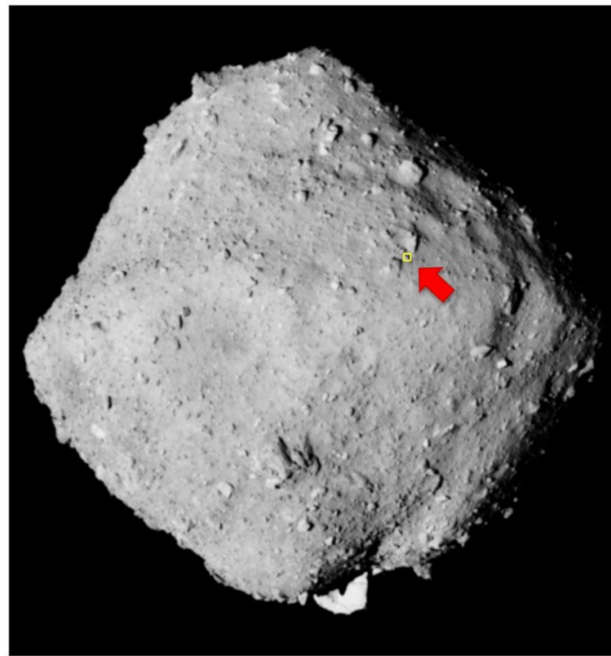
Fengyun-1C
2007

Současné trendy

- Privatizace a komercializace
- Turismus
- Těžba surovin?
- Nárůst počtu aktérů i využívání



NewSpace / Space 4.0



NewSpace

- Velký nárůst aktérů díky technologickému postupu
 - Zlevňování vývoje, výroby a operování satelitů a nosných raket
- Různorodá odvětví – například technologické IT firmy, investiční a mediální společnosti
- Nové přístupy, důraz na inovaci, snižování celkové ceny z důvodu konkurence
- Společnosti vyrábějí produkty, které nejsou perfektní, ale dostatečné
 - Prioritu má nižší cena před perfektním výkonem, spolehlivostí či výdrží
- Přístup je reflektován v efektivnějších a jednodušších procesech při výrobě
 - Levnější komponenty, 3D tisk, open source software, adaptabilní výrobní a produkční model
 - Nejvíce evidentní u menších společností v satelitním sektoru

Co sledovat?

- Privátní sektor
- Právní systém
- Miniaturizaci - nano a mikrosatelity
- Autonomní systémy
- Antisatelitní zbraně
- Planetary Defence
- 5. bojová doména NATO



- http://spacesecurityindex.org/ssi_editions/space-security-2019/
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- ASBECK, Frank, 2015. Policy Framework for Space Security Activities in the EU. In: Youtube.com [online]. Dostupné z: <https://www.youtube.com/watch?v=xGKdT8oYBX0>
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- SATCEN EU. 2018b. EU Satellite Centre Annual Report 2017. European Union Satellite Centre [online]. Dostupné z: https://www.satcen.europa.eu/key_documents/EU%20SatCen%20Annual%20Report%2020175af3f893f9d71b08a8d92b9d.pdf