

Moderní technologie a bezpečnost

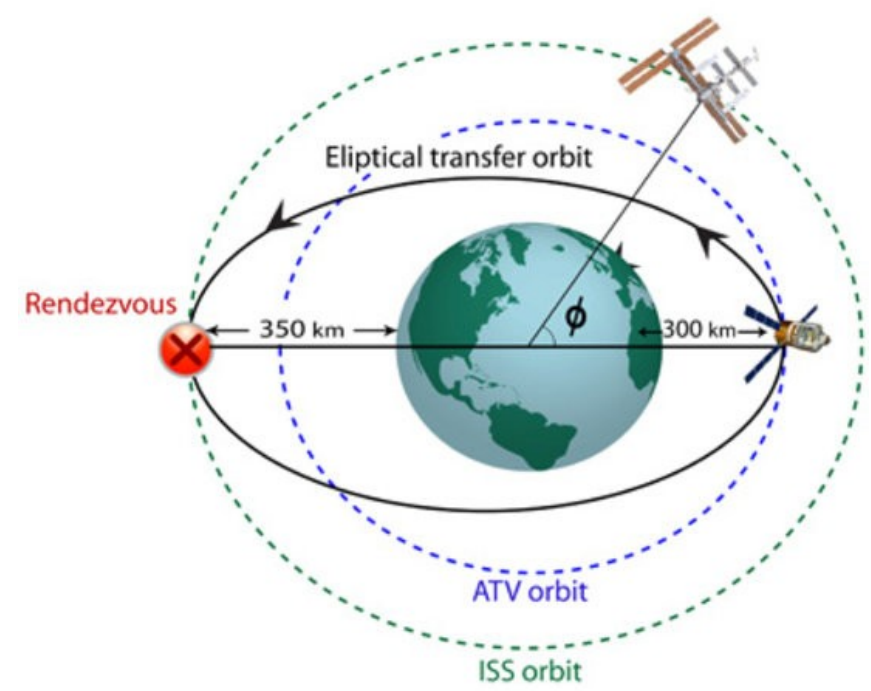
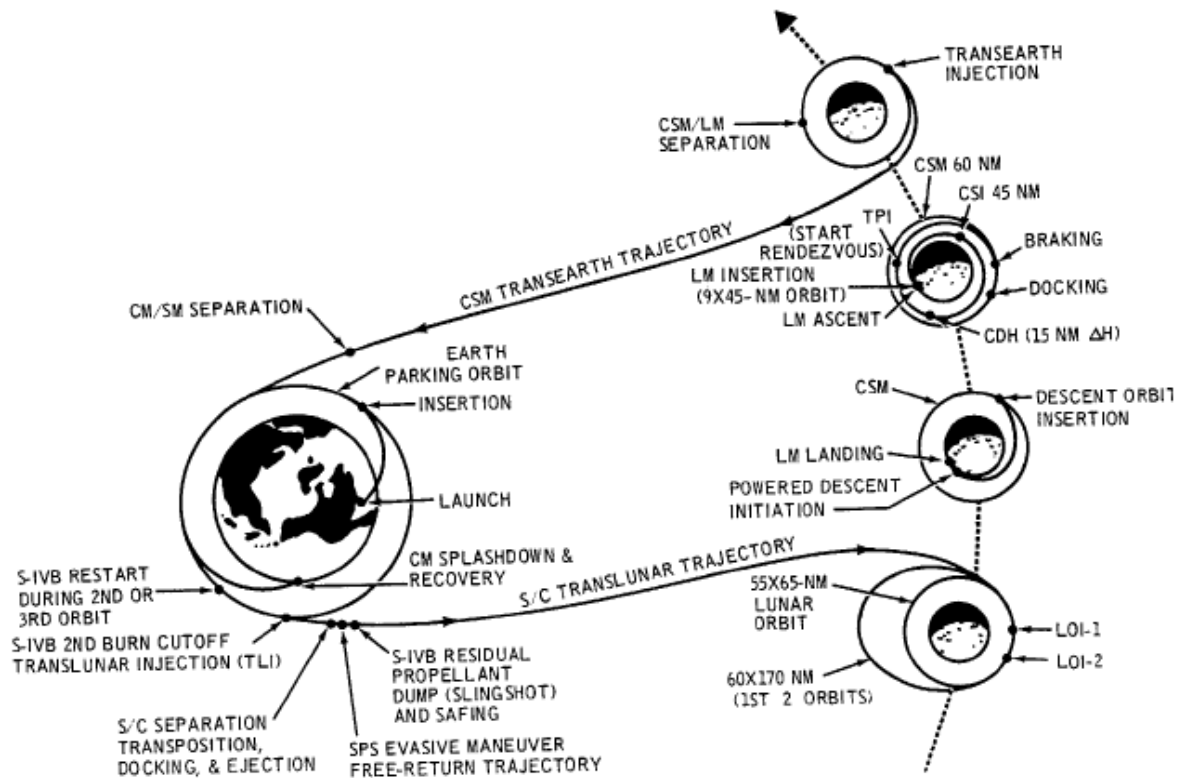
Vesmír



21.10.2024

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



Future spaceflights [[edit](#)]

Scheduled future flights are shown below:

Spacecraft	ISS Flight No.	Mission	Launcher	Scheduled date (UTC) ^{[85][86][87]}
SpaceX CRS-31	CRS SpX-31	Logistics	Falcon 9 Block 5	30 October 2024
Progress MS-29	ISS-90P	Logistics	Soyuz 2.1a	21 November 2024
SpaceX CRS-32	CRS SpX-32	Logistics	Falcon 9 Block 5	December 2024
Cygnus NG-22	CRS NG-22	Logistics	Falcon 9 Block 5	February 2025
Progress MS-30	ISS-91P	Logistics	Soyuz 2.1a	12 February 2025
SpaceX CRS-33	CRS SpX-33	Logistics	Falcon 9 Block 5	March 2025
HTV-X1	HTV-X1	Logistics	H3-24W	March 2025
SNC Demo-1	ISS-SNC-1	Logistics	Vulcan Centaur VC4L	May 2025
Progress MS-31	ISS-92P	Logistics	Soyuz 2.1a	May 2025
Cygnus NG-23	CRS NG-23	Logistics	Antares 300	Late 2025
SpaceX CRS-34	CRS SpX-34	Logistics	Falcon 9 Block 5	Late 2025
Progress MS-32	ISS-93P	Logistics	Soyuz 2.1a	August 2025
Progress MS-33	ISS-94P	Logistics	Soyuz 2.1a	October 2025
Progress MS-34	ISS-95P	Logistics	Soyuz 2.1a	February 2026
Cygnus NG-24	CRS NG-24	Logistics	Antares 300	Early 2026
SpaceX CRS-35	CRS SpX-35	Logistics	Falcon 9 Block 5	Early 2026
Progress MS-35	ISS-96P	Logistics	Soyuz 2.1a	May 2026
Cygnus NG-25	CRS NG-25	Logistics	Antares 300	Late 2026
Progress MS-36	ISS-97P	Logistics	Soyuz 2.1a	August 2026
Progress MS-37	ISS-98P	Logistics	Soyuz 2.1a	October 2026
US Deorbit Vehicle	?	Deorbit	?	2030

expedition [[edit](#)]

h	Crew	Arrival (UTC)	Arrival Flight	Departure (UTC)	Departure Flight	Duration (days)
	 Matthew Dominick Michael Barratt Jeanette Epps Alexander Grebenkin			October 2024 (planned)	SpaceX Crew-8	
	 Aleksey Ovchinin Ivan Vagner Donald Pettit		Transferred from Expedition 71	March 2025 (planned)	Soyuz MS-26	
	 Barry E. Wilmore Sunita Williams ^[note 9]			February 2025 (planned)	SpaceX Crew-9	
	 Nick Hague Aleksandr Gorbunov	29 September 2024 21:30	SpaceX Crew-9			
	 Anne McClain Nichole Ayers Takuya Onishi Kirill Peskov		February 2025 (planned)	SpaceX Crew-10		
	 Sergey Ryzhikov Alexey Zubritsky Jonny Kim	March 2025 (planned)	Soyuz MS-27			
				Will be transferred to Expedition 73		





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

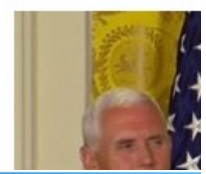


NEWS Home Video Wor

US & Canada

Trump sp military b

18 June 2018



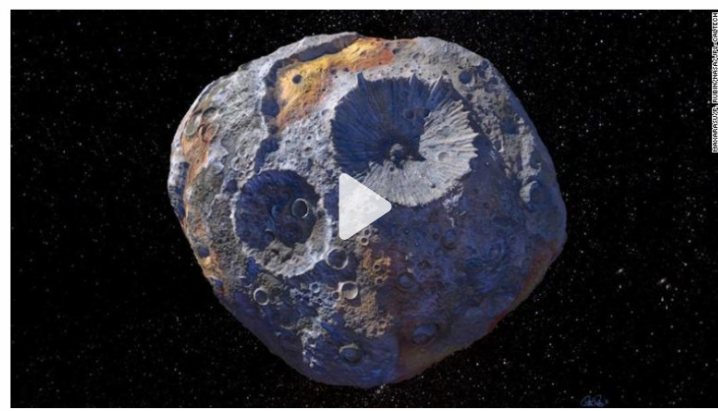
News Sport Weather Shop Earth Travel Mor

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

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

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'

SPACE NEWS

As DoD grows more reliant on commercial space, the relationship

by Sandra Erwin — September 22, 2022

DoD and the intelligence community are growing more reliant on commercial space services they would use for military and intelligence purposes.



ORGANIZATION | TOPICS |

e-Library > Official texts (Chronological)

NATO's overview

17 Jan. 2022 - Last updated: 17 Jan. 2022

English | French

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

Legal Markets Breakingviews Technology Investigations More

Updated 11 days ago

SpaceX asks for a new deal as Iran of jamming its satellites

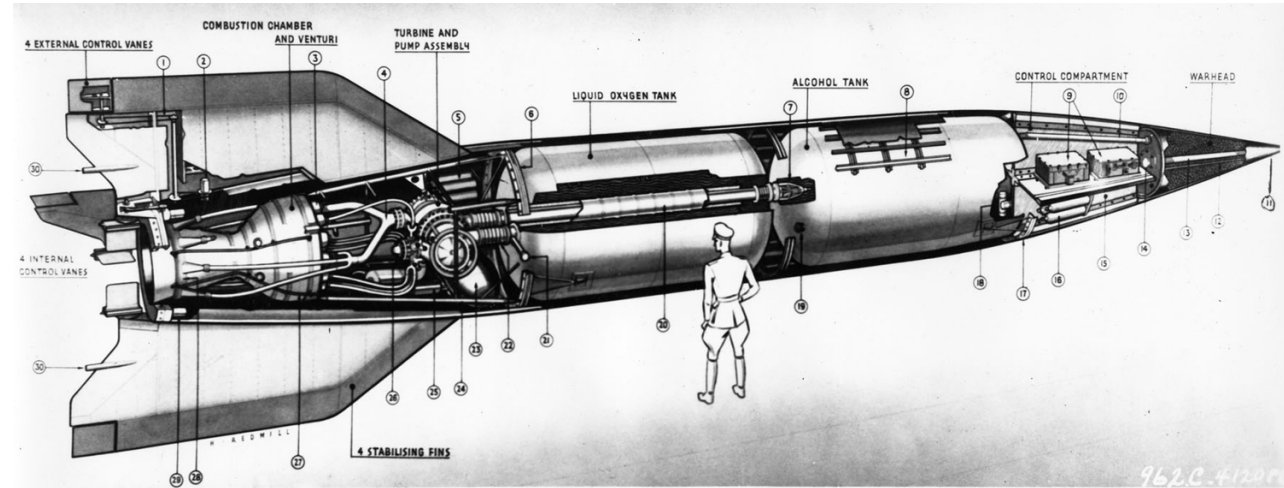


- 1) vesmír a Kármánova linie

- 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

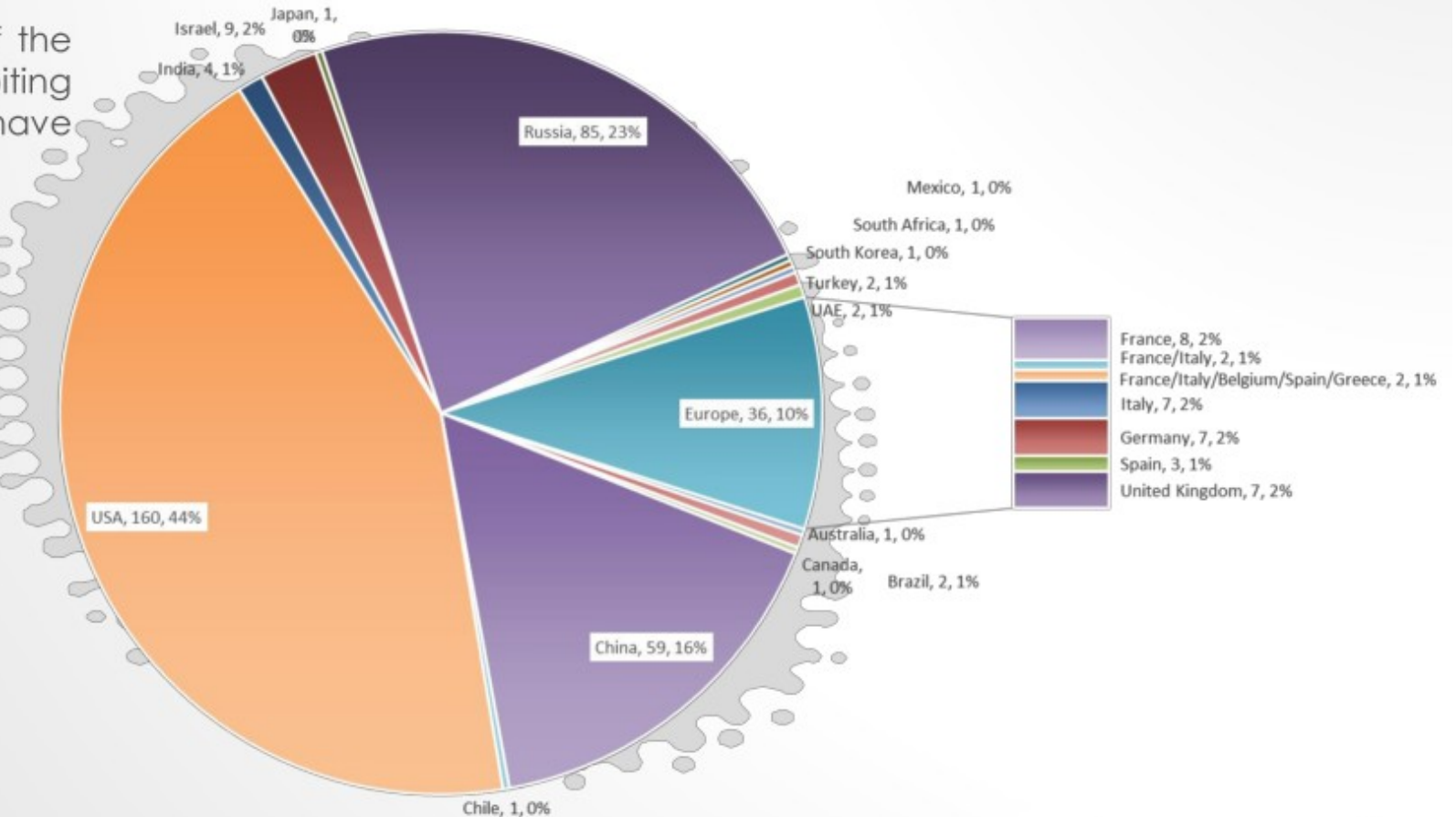
NATIONAL DEFENCE SATELLITES

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

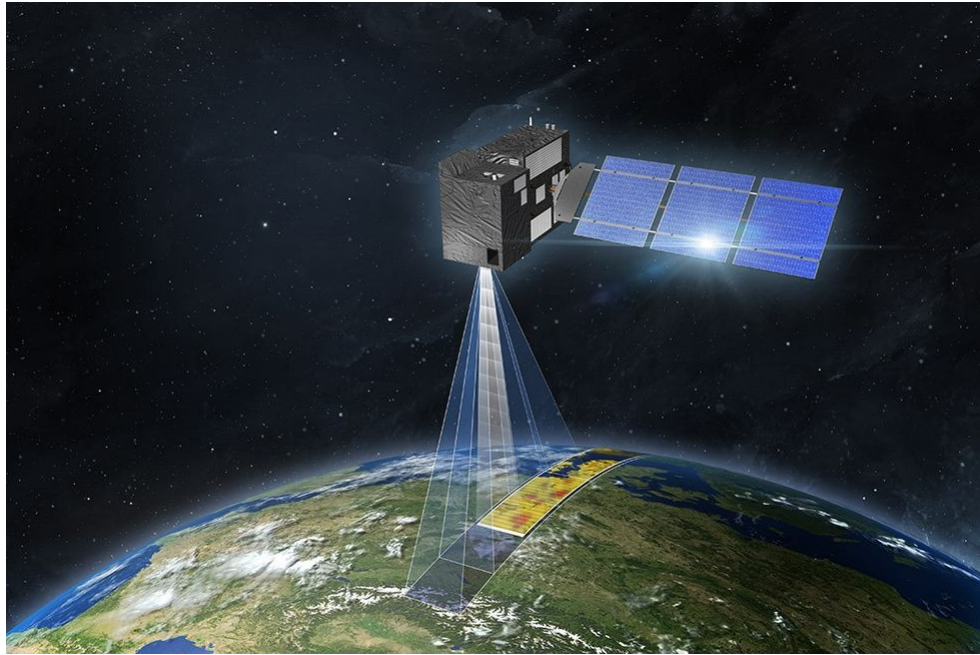
US: 30.6% Remote Sensing (49)
 27.5% Communications (44)
 19.4% Navigation (31)
 17.5% Technology (28)
 3.1% Space Observation (5)
 1.9% Space Science (3)

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 7,560 satellites currently orbiting Earth, including their country of origin, purpose, and other operational details.

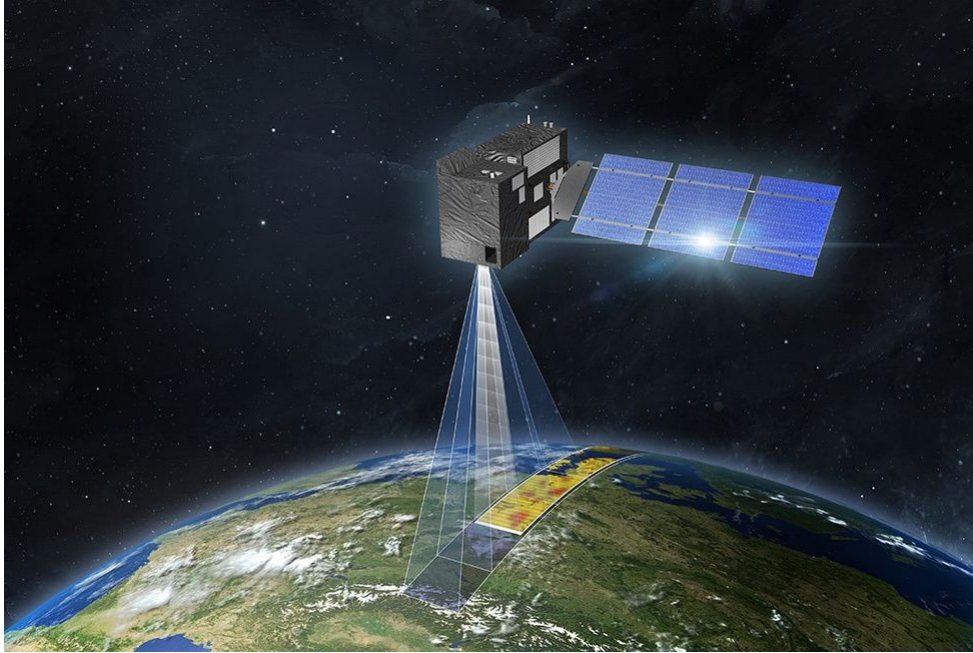
Published Dec 8, 2005 | Updated May 1, 2023

Satellite quick facts

Includes launches through 5/1/2023

- **Total number of operating satellites: 7,560**
 - United States: 5,184
 - Russia: 181
 - China: 628
 - Other: 1,572
- LEO: 6,768
- MEO: 143
- Elliptical: 59
- GEO: 590
- **Total number of US satellites: 5,184**
 - Civil: 30
 - Commercial: 4,741
 - Government: 167
 - Military: 246

Satellite



REPORTS & MULTIMEDIA / FEATURE

UCS Satellite Database

In-depth details on the 4,084 satellites currently orbiting Earth, including their country of origin, purpose, and other operational details.

Published Dec 8, 2005 | Updated May 1, 2021

Satellite quick facts

Includes launches through 4/30/2021

- **Total number of operating satellites: 4,084**
 - United States: 2,505
 - Russia: 168
 - China: 431
 - Other: 980
- LEO: 3,328
- MEO: 139
- Elliptical: 57
- GEO: 560
- **Total number of US satellites: 2,505**
 - Civil: 32
 - Commercial: 2,091
 - Government: 166
 - Military: 216

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

Copernicus Service in Support to EU External Action

The image displays a grid of nine satellite imagery examples, each with a label below it, illustrating the Copernicus Service's support to EU External Action. The examples include:

- Reference Map
- Road Network Status Assessment
- Conflict Damage Assessment
- Critical Infrastructure Analysis
- Support to Evacuation Plan
- Non-EU Border Map
- Camp Analysis
- Crisis Situation Picture
- Activity Report

Earth observation satellites



→ Used for **recognition**

Optical

- high resolution
- Small area
- Daytime, clear skies

DigitalGlobe

→ Used for **detection**

Radar

- low resolution
- Wide area
- Through clouds and night

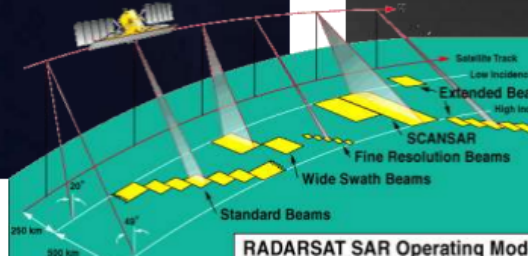
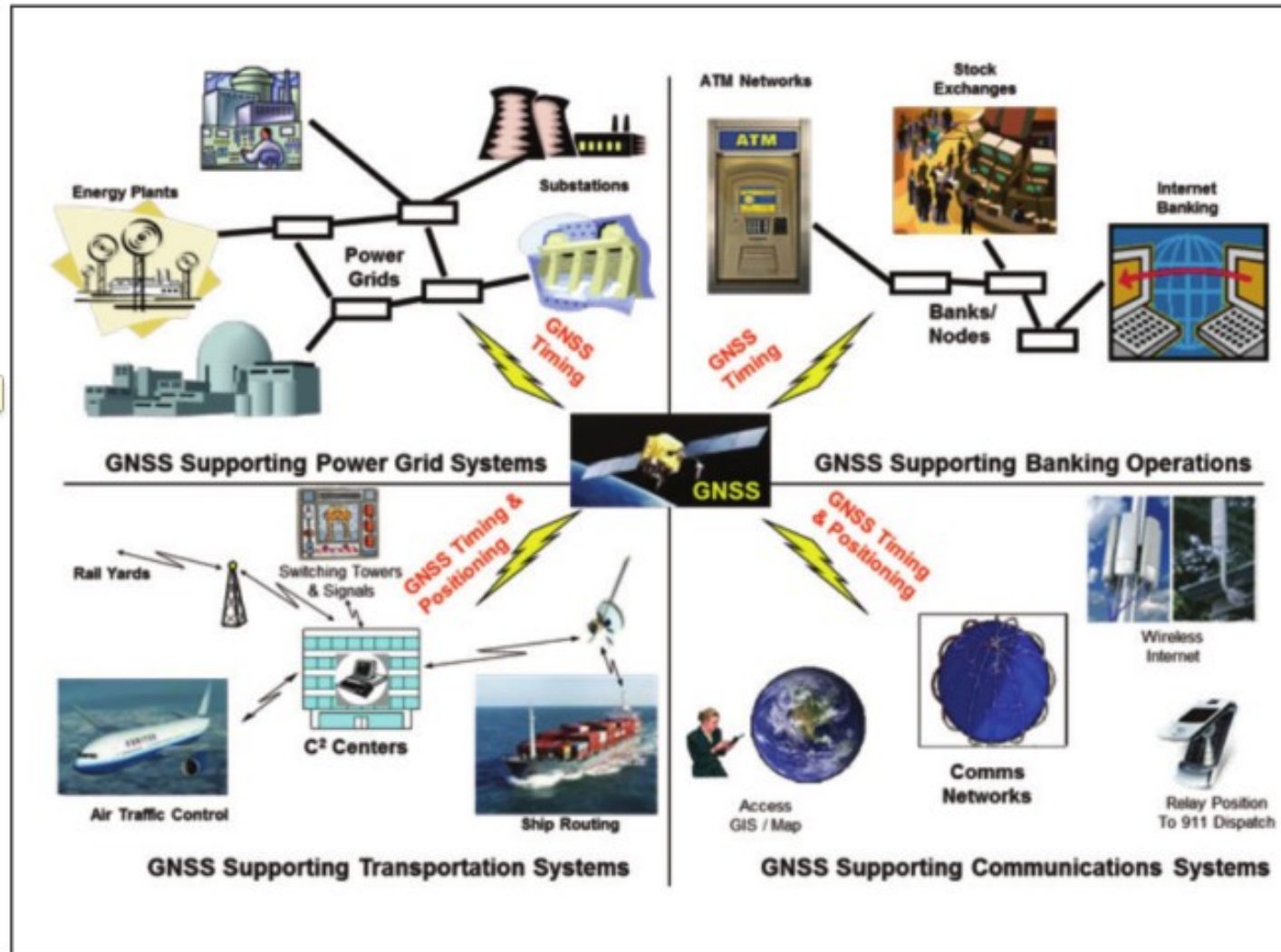
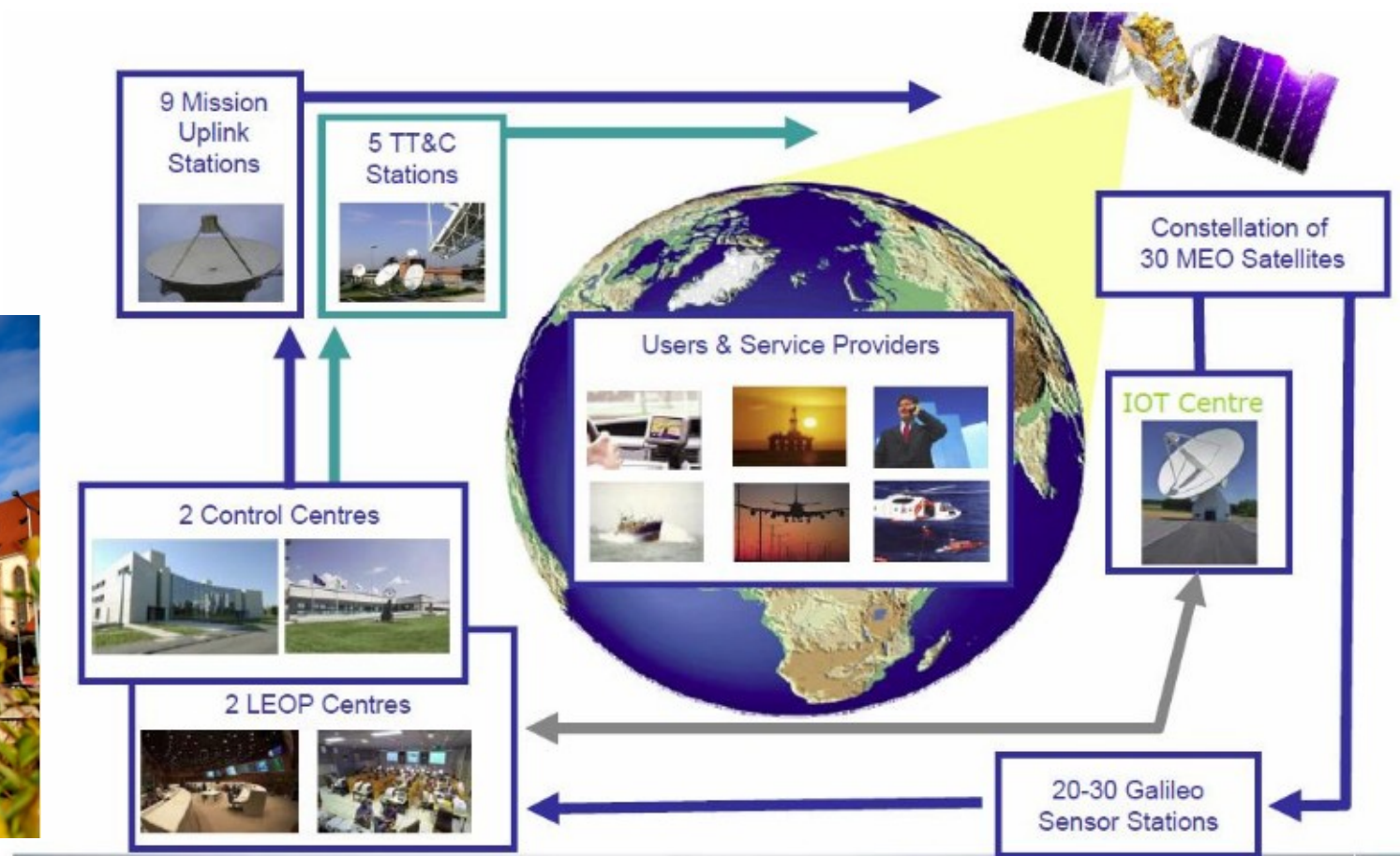


Figure 5: Today's reliance on GNSS positioning and timing signals





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

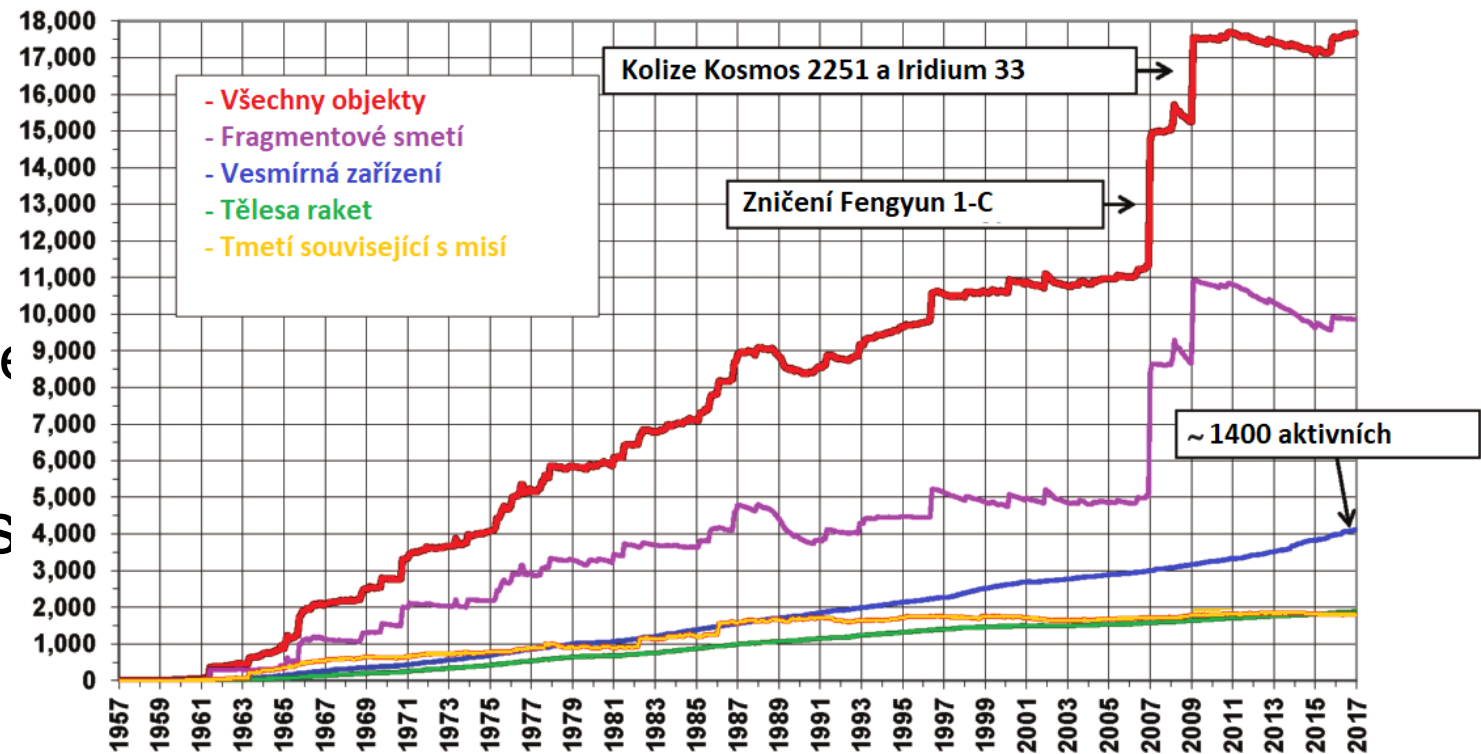
Rizika a hrozby

- 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

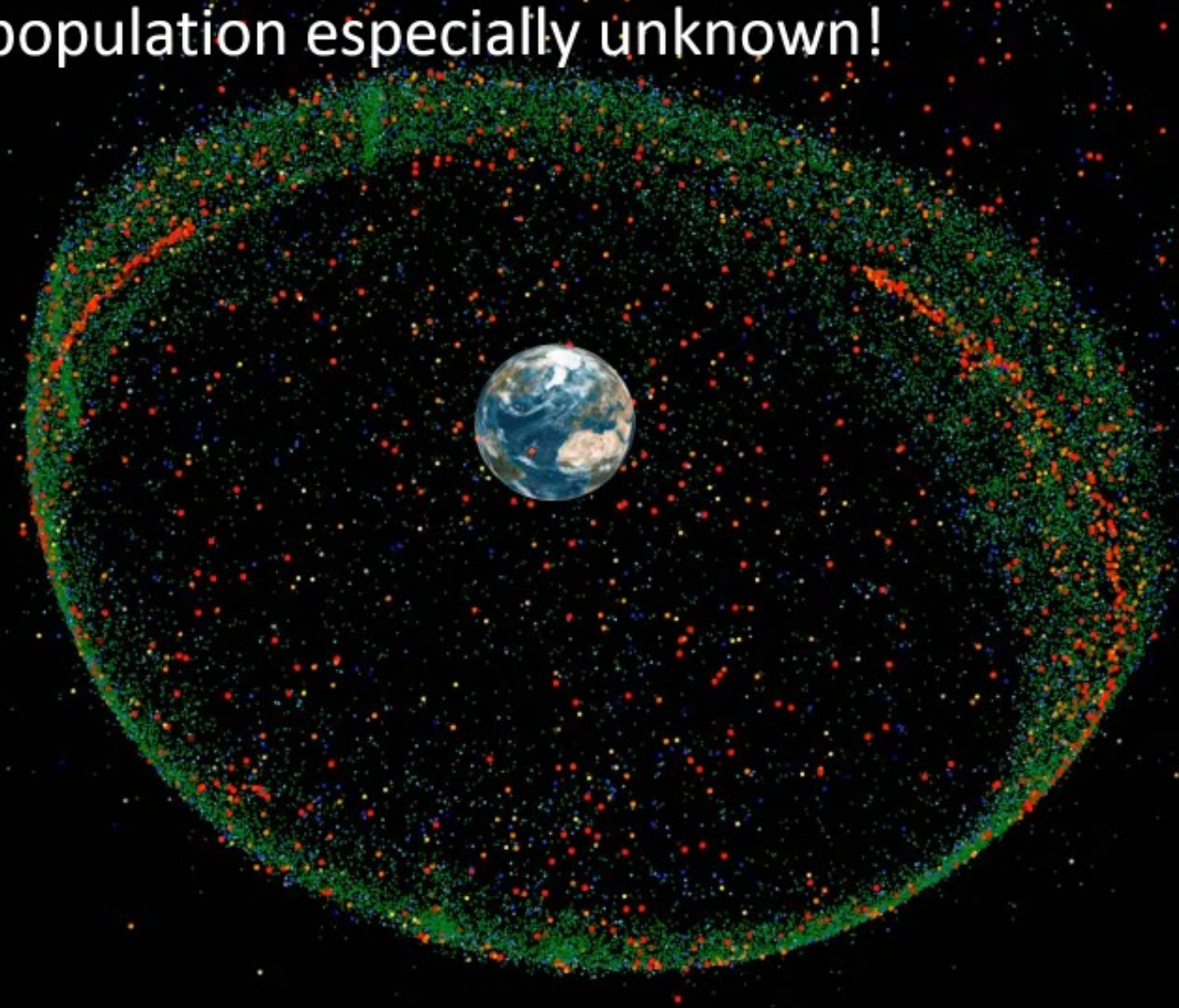
← Today's
public
catalog

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

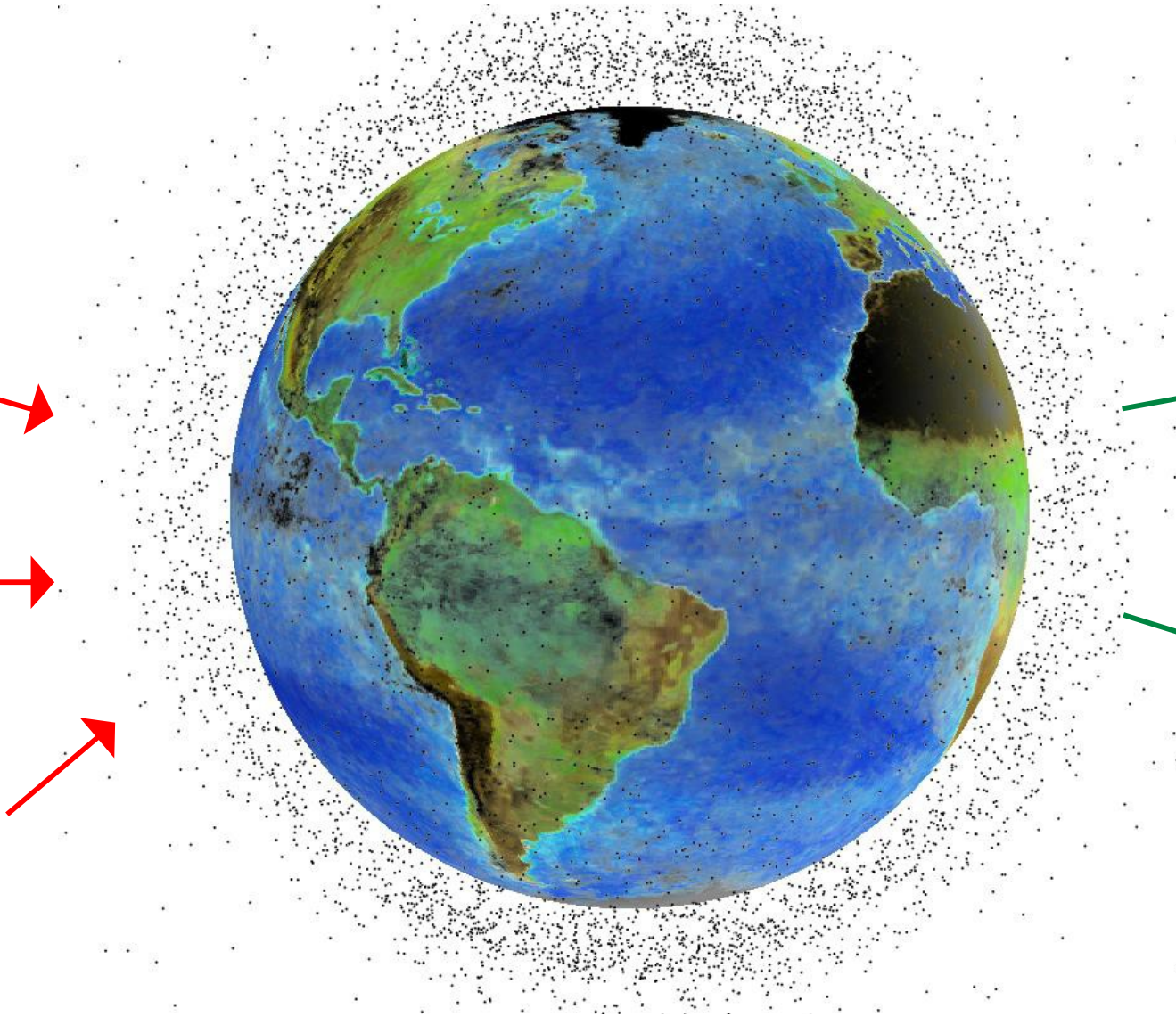


Sources

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)

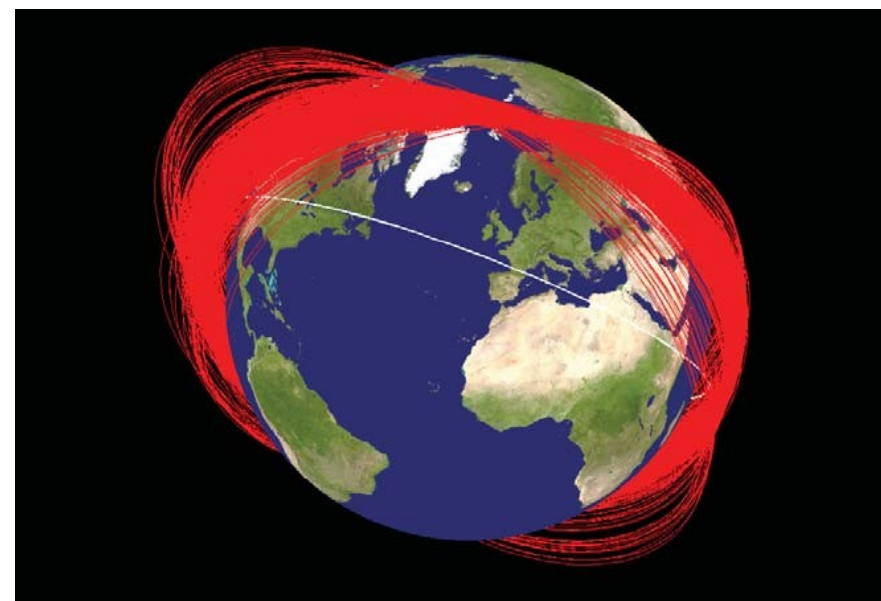
Active Removal (de-orbit, non-propulsive maneuvers)



Starfish Prime
1962



SM-3 raketa
2008



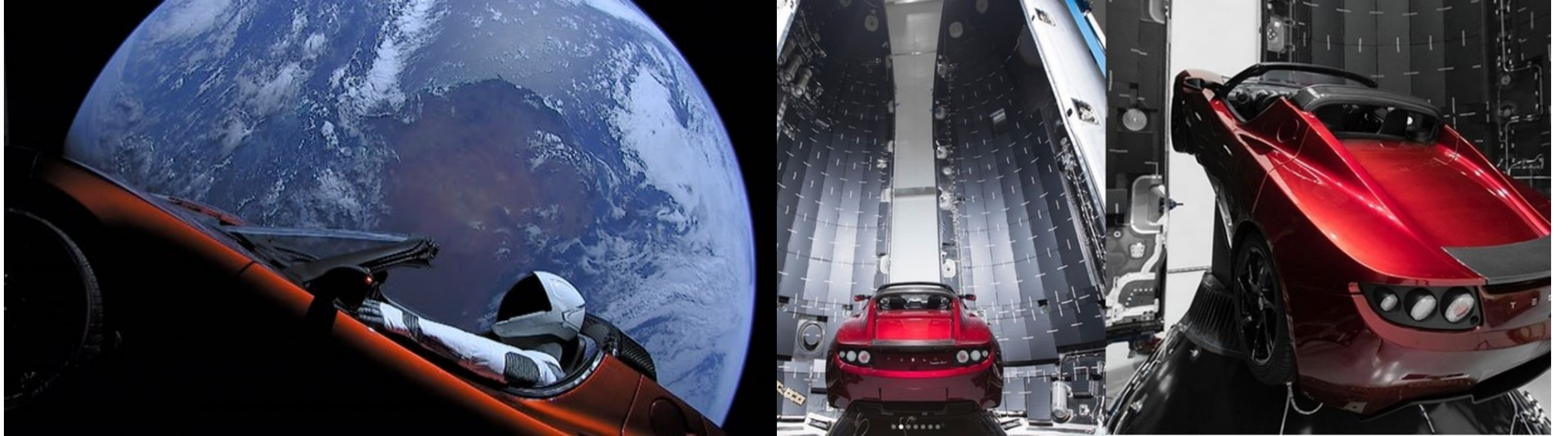
Fengyun-1C
2007

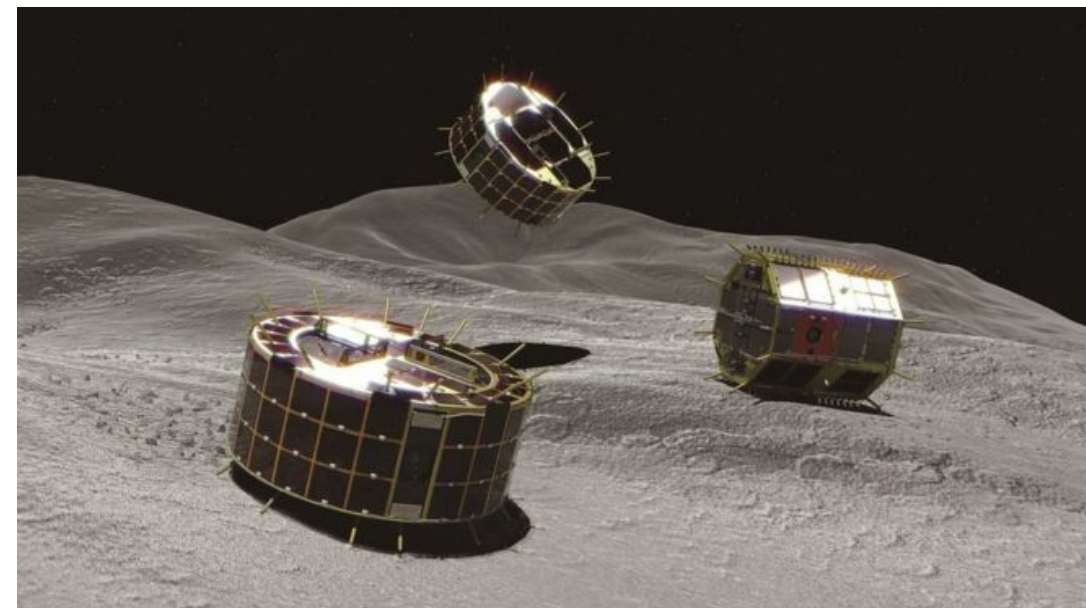
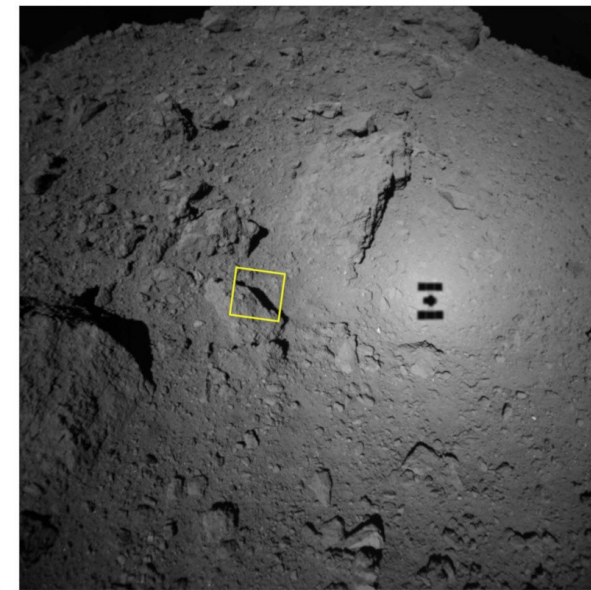
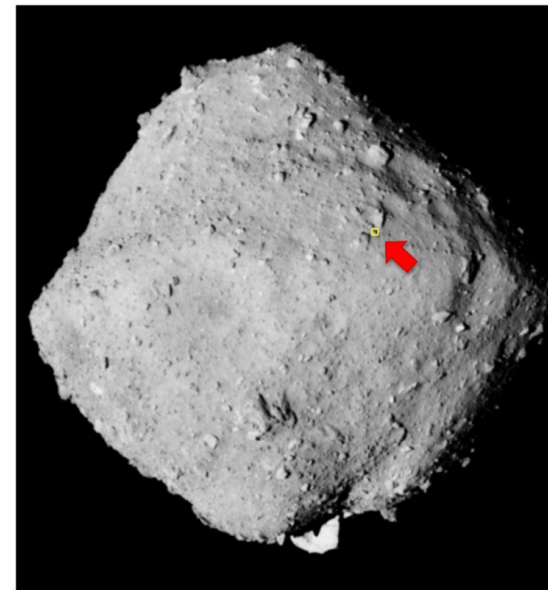
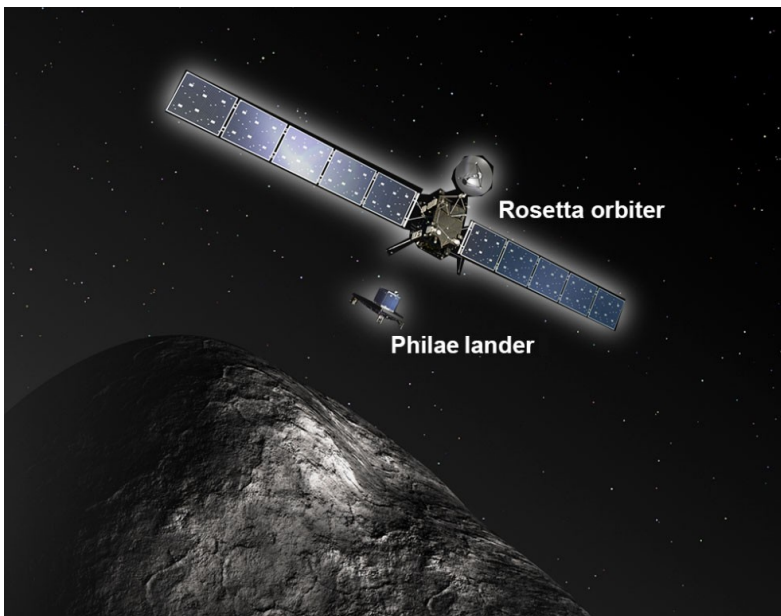
Současné trendy

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



NewSpace / Space 4.0





Rosetta Mission - a detailed study of a comet

Hayabusa2 – asteroid sample return mission

Civil

Scientists excited by first look at OSIRIS-REx asteroid samples

Jeff Foust October 12, 2023



- Asteroid Bennu
- Start 2016, sběr 2020, září 2023 návrat na Zemi
- 250 gramů materiálu, cíl mise byl 60 gramů



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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- https://www.thespacereview.com/article/4056/1?fbclid=IwAR3iKGDts9VY3y2DXMz4hhxAmKSXeosjxS056AkAlnx62W5ht1aA_PLIc5w
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- <https://www.businessinsider.com/space-race-anti-satellite-china-russia-war-us-2017-07#ampshare=http://www.businessinsider.com/space-race-anti-satellite-china-russia-war-us-2017-07>
- <http://www.thespacereview.com/article/3331/1>
- https://www.ted.com/talks/will_marshall_the_mission_to_create_a_searchable_database_of_earth_s_surface
- 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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