

4 FEBRUARY 2024

# THE FINAL FRONTIER FLASH

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# Iran: IRGC Successful Launch of Sorayya Satellite

20 Jan: Iran successfully launched its Sorayya satellite into orbit using a Qaem 100, a three-stage solid-fuel rocket built by Iran's military Revolutionary Guards. [Launch Video](#).

- Iran successfully placed the Sorayya satellite into a ~750 km orbit with a 64.5° inclination. At the time, this was the highest orbit successfully reached by Iran.
- Iran launched the Qaem 100 from the Shahrud Space Center in Northeast Iran. Developed by IRGC, the Qaem 100 was first tested on sub-orbital flight on 5 Nov 2022, and its first orbital mission failed on 4 Mar 2023.

- The Qaem-100 is the IRGC's latest carrier rocket, based on the older Qased, a proven rocket that has successfully launched satellites into space at least three times in the past.

- Like the Qased, the Qaem-100 is also a three-stage solid-fuel rocket, but has twice the payload capacity, and can reach an apogee of 750km (Qased could only reach ~500 km).

- The IRGC announced the successful testing of the Qaem-100 engine two years ago, highlighting its 68,000 kg thrust rating, compared to older models with 30,000 kg.

- Iran's information and communications technology minister, Issa Zarepour, confirmed the reception of the satellite's first signal via a post on Iranian social media platform Virasty. He detailed that Soraya's ground satellite tracking stations received signals and telemetry data, indicating the satellite's subsystems were functioning correctly, and that the satellite was in good condition.

- The 47 kg Soraya satellite is designed for research and telecommunication purposes, with an expected lifespan of three years. Soraya is the fourth satellite launched by the IRGC aerospace division, as well as their first civilian satellite.

- According to the Iranian Ministry of Communications and Information Technology, Soraya is a research satellite developed by the Iranian Space Research Center (ISRC).

- Since 2020, IRGC has been developing its own space program in parallel with the civilian Iranian Space Agency (ISA), using solid-fueled carrier rockets and the Shahrud Rocket Site as its base.

- In April 2020, March 2022 and October 2023, IRGC military satellites Nour-1, Nour-2 and Nour-3 were sent into space by Qased carrier rockets, respectively.



**Qaem 100 Heading to Launch Pad (NASASpaceflight.org)**



**Qaem 100 Launch Trajectory (@planet4589 via X)**



# Iran: Successfully Launches Three Satellites

28 Jan: Iran launched three satellites using the Simorgh (Phoenix) satellite carrier rocket developed by the Iranian Space Agency. This was the Simorgh's first successful orbital flight, and also Iran's first multi-satellite launch, placing all three in 1,100 km orbit. Launch [Video](#).

- Iran launched the Mahda, Hatef-1 and Keyhan-2 satellites into an 1,100 x 450 km orbit with a 58.7° inclination. The 1,100 km apogee was a new record for Iran, surpassing the Qaem 100 record set 8 days earlier.

- This was also Iran's first successful launch of multiple satellites.

- The Simorgh is the largest and most powerful Iranian rocket in both dimensions and capabilities, and replaces the older Safir rocket.

-Iran began Simorgh development in 2010, and conducted the first test flight in 2016. Iran conducted four more tests in the following five years. The launches all encountered problems, but Iran made progress with each new flight. The system now appears to be fully operational.

- Mahda is a research satellite designed, manufactured, assembled and tested at the Iranian Space Research Center (ISRC), a subsidiary of the Ministry of Communications and Information Technology.

- Mahda is the largest of the three satellites with a mass of 32 kg. The Defense Ministry described its objectives as testing advanced satellite subsystems, plus assessing the Simorgh carrier's performance with multiple launches.

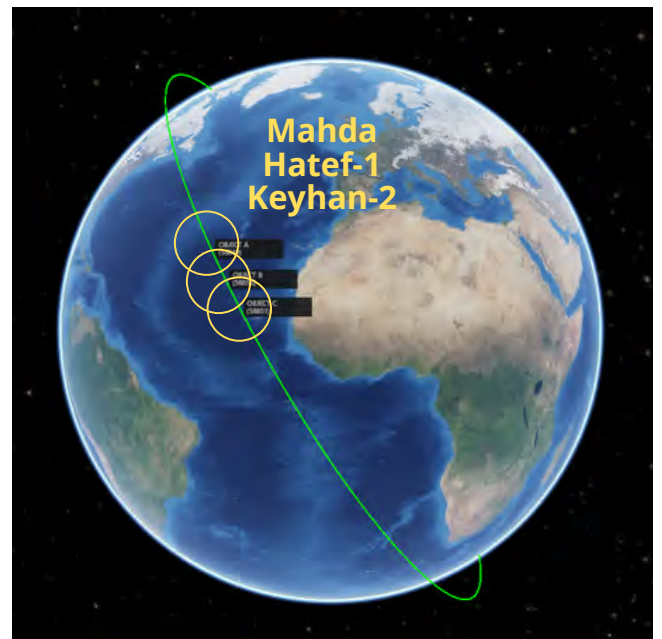
-Hatef-1 and Keyhan-2 are nanosatellites with a mass <10 kg. These small spacecraft were designed and developed Iran Electronics Industries (IEI), a state-owned subsidiary of the Defense Ministry.

- Iran developed Keyhan-2 for space-based positioning. The vehicle carries status determination and control subsystems to aim stably and precisely towards Earth.

- Hatef-1 seeks to prove the use of narrowband communication technology in the Internet of Things (IoT).



**Simorgh Ready For Launch (NASAspaceflight.org)**



**(NASAspaceflight.org)**

# China Launches Five Satellites on Lijian-1 Rocket

23 Jan: China launched the third Lijian-1 launch vehicle with five remote sensing satellites from the Jiuquan Satellite Launch Center. Lijian-1 (also known as ZK-1A and Kinetica-1) is a four-stage solid-propellant rocket jointly developed by the Institute of Mechanics of the Chinese Academy of Sciences and CAS Space. [Launch Video](#).

- The five satellites, Taijing-1C, 2B, 2D, 3B and 4C, are all in 539 x 520 km Sun-synchronous orbits with an inclination of 97.5°.

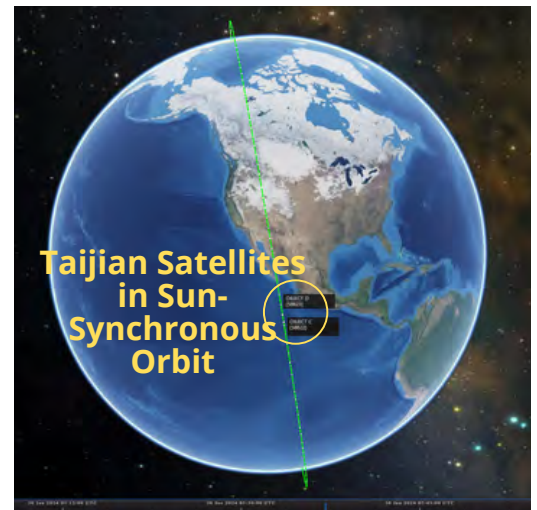
- Lijian-1 is a 30 m tall, four-stage, solid-fuel rocket, capable of lifting a 1,500kg payload into Sun-synchronous orbit. All three Lijian-1 launches have been successful.

-CAS Space, a Beijing-based commercial launch service provider, developed the Lijian-1 under the auspices of the state-owned Chinese Academy of Sciences (CAS).

-Lijian-1's debut flight in August 2022 briefly set a national rideshare record with its second outing, sending 26 satellites to orbit.

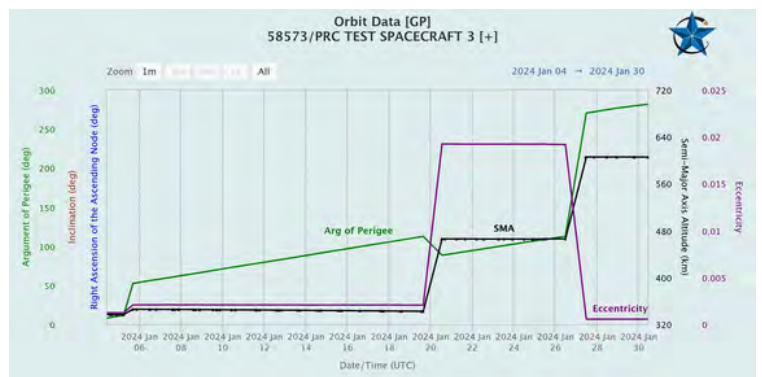
-All of these satellites have Earth observation missions. The Taijing-1C, 2B, 2D and 3B are electro-optical (EO) imagery, while the 4C is a phased array synthetic aperture radar (SAR) satellite operating in the Ku-band.

-The launch doubled the number of on orbit Taijing satellites to ten. The first launched in 2021; four launched in 2022. All appear to have been ride-share type missions, though analysts have yet to confirm some of them.



# China: Reusable Space Plane Maneuvers

30 Jan: China raised the orbit of its re-usable spaceplane 76% from 19-27 Jan. In just over a week the spaceplane's altitude increased from 344 km to 606 km. The first maneuver, on 19 Jan, resulted in an increase of 123.6 km. The spaceplane remained at its new altitude (465.6 km) for ~6 days before again increasing altitude by 140km, to its present (as of 30 Jan) 606 km SMA. China has not altered the vehicle's inclination, which is a fuel intensive maneuver. Launched on 14 Dec 2023, the spaceplane's intended mission duration and objectives remain unknown.



## China Launches 11 Geelyspace Satellites

2 Feb: China launched a Long March-2C from Xichang just before midnight on 2 Feb. On board were 11 “GEESats,” which are the second group of satellites intended to support autonomous vehicles. With this launch there are now 20 GEESats in orbit. Geespace plans to launch 72 GeeSats in a phase-1 constellation by 2025, and 168 in phase-2.

### Launch Video.

- Geely Holding Group is a Chinese conglomerate working to develop autonomous vehicles. GEESats are intended to expand the company’s capacity to provide more accurate navigation. See Geely Project Video.

- Orbit confirmation is ongoing. One object from the launch has been cataloged in 594 x 607 km x 50.0° orbit.

- Geely launched its first nine satellites in June 2022. All are coplanar at 600 x 617 km, and also 50.0° inclined.

- Geespace says the satellites will provide centimeter-level accuracy positioning and connectivity support. In addition to delivering navigation support the satellites have AI remote sensing, providing 1-5 m resolution images.

- Described as modular, high-resilience, high-performance, mass produced, low-orbit satellites, each will have an operating lifespan of five years.

- Geely aims to offer Precise Point Positioning and Real-Time Kinematic (PPP-RTK) services.

- Per Geespace CEO & Chief Scientist: "By establishing the Geely Future Mobility Constellation, Geespace is positioning itself to meet future user demands for high-precision positioning, space-based communication, and remote sensing services."

## China: Sea Dragon-3 Launches Nine Satellites

3 Feb: China launched a Smart Dragon 3 off the coast of Yangjiang in Guangdong province. There were 9 remote sensing satellites on board, including Egypt’s NExSat-1. Launch Video. Also check out awesome Dongfang hour Video.

- The China Academy of Launch Vehicle Technology (CALT), a major state-owned civilian and military space launch vehicle manufacturer, operates the China Sea Dragon-3.

- Smart Dragon 3 made its maiden flight in December 2022, placing 14 satellites into orbit from a ship in the Yellow Sea. Its second mission took place in December 2023 off Yangjiang, becoming the first sea-based rocket launch from the South China Sea.

- China has now performed 10 sea-based launches – five by the Long March 11 rocket model, three by the Smart Dragon 3, one by the Ceres 1, and one by the Gravity 1. Seven of these took place in the Yellow Sea, with three in the South China Sea.



**LM-2C Lifts off (top)  
GEESats Prepare for Launch  
(@CNSpaceflight via X)**



**Sea Dragon-3 Lift Off (@CNSpaceflight via X)**

## China: Another Hop Closer to Reusable Rockets

18 Jan: Chinese commercial company Landpace successfully hopped its ZhuQue-3 hopper prototype. The pathfinder hopper was announced after the conclusion of the third ZhuQue-2 launch campaign, as a demonstrator technology for the company's upcoming ZhuQue-3 rocket. The hop itself went to 350 meters and performed a small translation maneuver to the landing pad. Landpace confirmed the landing precision with 2.4 meters, with a landing speed of 0.75 meters per second, at a pitch angle of roughly 0.14 degrees, and a roll angle of 4.4 degrees. The hopper survived the test. [Hop Video](#).

- Landpace intends to learn from the hopper program, planning eventual use in its ZhuQue-3. This is a medium-to-heavy lift launch vehicle, powered by methane, and constructed out of stainless steel. The rocket will use the updated TQ-12A engines and plans a reusable first stage, that can support up to 20 flights. The full size of the rocket will be 76.6 m, with a diameter of 4.5 m. Landpace plan this rocket's [debut in 2025](#).

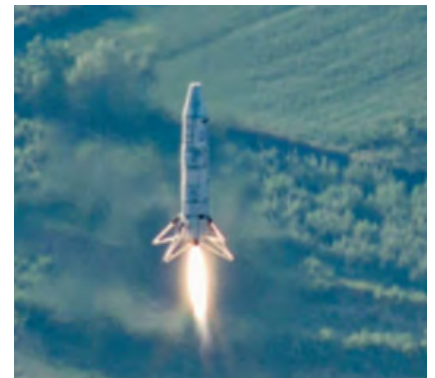


**ZhuQue-3 Hopper in mid-flight**  
(NASASpaceflight.org)

### Other Notable Reusable Rocket Testing:

In order to increase its launch capacity and decrease costs, China has several initiatives underway to develop an operational reusable rocket. All are ramping up to be a part of the Guowang Mega-Constellation. Check out a gret [Overview Video from Dongfang Hour](#) (June 2023). In addition to Landpace, here is a look at the commercial leaders:

1. Deep Blue Aerospace: conducted a [kilometer-level hop test](#) of its Nebula-M1 in May 2022. The test did not use a rocket engine intended for orbital flights. [Test Video](#).
2. iSpace: [Successfully launched and landed a test article on 11 Dec 2023, a month after a first hop test](#). Hyperbola-2Y reached an altitude of 343.12 meters, translating 50 meters to a landing zone, touching down with a velocity of 1.1 meters per second and an accuracy of 0.295 meters. The entire flight lasted 63.15 seconds. The flight came just over a month after a 2 Nov. [first hop test](#). That test reached 178 meters and returned to its landing spot. The company is targeting a first flight of the 13.4 metric tons to low Earth orbit (LEO) Hyperbola-3 rocket, in 2025. A demonstration of recovering and reusing a first stage will follow in 2026. The 69-meter-long rocket will be able to lift 8.5 tons to LEO in reusable mode. [Test Video](#).
3. Galactic Energy: This company performed a [hop test with a jet engine-powered test article in August 2023](#). This was part the Pallas-1 kerosene-liquid oxygen reusable launcher development. Galactic Energy plans a first expendable flight in the third quarter of 2024.



**Nebula-M1 1km Hop**  
(aerotime.aero)



**iSpace Hyperbola-2Y**  
(spacenews.com)

## Russia: Starlink Jamming Efforts Unsuccessful

27 Jan: A *Business Insider* article looks at Ukraine's continued use of Starlink, and Russia's unsuccessful attempts to deny service. Russia has been using jamming systems to try and deny Ukrainian forces' access to commercial satellites. Russia's jamming has become increasingly better at disrupting Ukraine's most advanced weapons, hindering Ukraine's fighting capacity. But Russian efforts to cut off Ukraine's Starlink satellite access have failed thus far.

- Russia has included Electronic Warfare (EW) since the beginning of its invasion of Ukraine. It has attached jammers to its tanks to interfere with satellite signals, disrupt exploding drones, jam Ukraine's GPS-guided bombs, and jam Ukrainian drones, forcing Ukrainian operators to move closer to their frontline targets.

- In spite all of their EW equipment and expertise, Russia has yet to find success against Starlink. Per Brian Wheedon (Secure World Foundation) "Russia absolutely would like to find a way to negate Ukraine's use of Starlink. But that is much easier said than done because of the architecture of the constellation."

- Starlink's signals are stronger and more concentrated, because its satellites operate at a far lower altitude than geostationary satellites.

- Wheedon notes there is "very little" open data about Russian electronic attacks on Starlink, though their efforts appear to have yielded little success.

- Aerospace Security Project Director Kari Bingen notes: "They [Russia] keep trying, but they don't seem very successful."

- She said Starlink satellites are both "resilient" and "agile," with Starlink operators constantly updating their software to overcome Russian attacks.

- Starlink first came under attack in April 2022, and then as now, SpaceX engineers fought off Russian jamming attacks by updating Starlink system software.

- No other Russian jamming or hacking attacks against Starlink have been reported.

- Russia has deployed its full arsenal of EW systems to Ukraine. This includes the Krasukha-4 mobile EW system, which can counter airborne early warning and control systems and other airborne radars within a range of ~186 miles.

- According to a leaked US classified-intelligence document obtained by the *Washington Post* last year, Russia has been testing its Tobol electronic-warfare systems for several months, hoping to obstruct Starlink's signals.

- Ukraine has been targeting Russian EW systems. Special forces appeared to destroy a Tirada and a "Leer-2" electronic system with drones. Video. Ukraine's military reported destroying multiple Russian systems including a "Pole-21" EW system and a "Svet-KU". The same special forces command said they helped destroy a Russian Tirada-2 that was blocking satellite communications in eastern Ukraine.



**Ukrainian Starlink in the Field**  
(businessinsider.com)



**Ukrainian Missile Destroying Tirada-2**  
(businessinsider.com)

# Belgium Latest Country to Sign Artemis Accords

23 Jan: Belgium signed the Artemis Accords in Brussels, making it the 34th country to do so. "Joining the Artemis Accords reflects our logic of cooperation and enables Belgium to join the working group of states that have already signed," said Thomas Dermine, Belgium's state secretary for economic recovery and strategic investments. His responsibilities include leading Belgium's science policy.



Signing Ceremony in Brussels (space.com)



Artemis Signatories (NASA.gov)



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TGT310 - Weaponing and Collateral Damage Assessment  
TGT311 - HVI Target Development  
TGT312 - Precision Point Mensuration  
TGT315 - Targeting Professional

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# Pics o' the week!



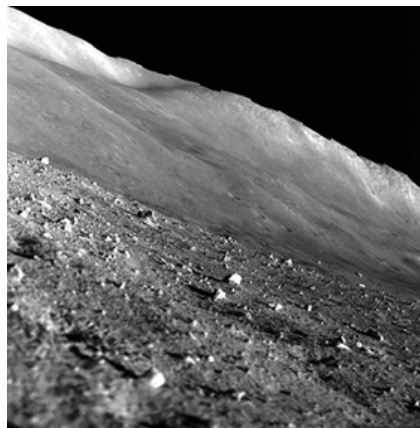
Image from Lunar Exploration Vehicle (LEV-2) of Japan's lunar lander. SLIM Vehicle is missing one rocket nozzle and is on its nose. (@AndySaunders\_1 & @JAXA\_en via X)



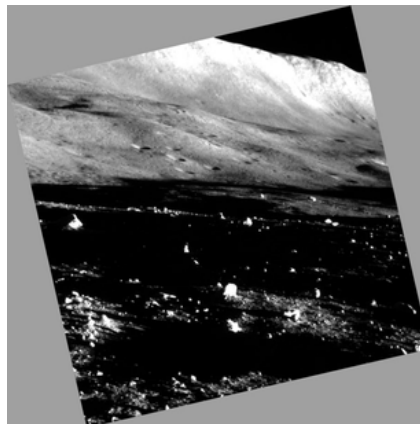
Artist Rendering of anticipated landing orientation. (@AndySaunders\_1 via X)



LEV-1 (@payapima via X)



LEV-2 (@payapima via X)



In spite of the challenging landing (one SLIM's main engine nozzles fell off) JAXA was able to wait for favorable solar conditions to power SLIM and conduct lunar studies. (@SLIM JAXA via X)



The Mars Ingenuity helicopter sent back this image following the unexpected loss of communication during its 72nd \*of five\* planned flights on 18 January 2024. One of its main rotor blades is damaged, and the helicopter will not fly again.  
(@ThePlanetaryGuy via X)

**72**  
Flights

**Up to 5**  
Planned Flights

**79**  
Feet Highest Altitude

**1st**  
Helicopter on Another Planet

**INGENUITY**  
MARS HELICOPTER

**128+**  
Minutes in Flight

**2+**  
Years Lifespan

**11**  
Miles Flown

Reference Scale

mars.nasa.gov/ingenuity

National Aeronautics and Space Administration

NASA

End of a Remarkable Run.  
(@SierraSpaceCo via X)



**Blue Origin's New Glenn 1st and 2nd Stages Mate for First Time. First launch expected later in 2024.  
Estimated capacity: 50T to LEO  
([@blueorigin](#) via X)**



**From New Zealand with Love: Rocketlab's Electron Heads to Orbit  
([@RocketLab](#) via X)**



**12 Sep 1966: Gemini 11 launch with SA500F  
(Saturn V pad test article) in the  
background on Pad 39A.(@Maxarick via X)**

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