

# **SCIENCE & TECHNOLOGY**

## #DRDO SUCCESSFUL TEST-FIRED SFDR TECHNOLOGY

- The **Defence Research and Development Organisation** on March 5, 2021, successfully conducted a flight test of the **Solid Fuel Ducted Ramjet- SFDR missile propulsion system** from the **Integrated Test Range in Chandipur, Odisha**.



- According to an **official statement from DRDO**, all the subsystems, including nozzle less motor and booster motor, performed at the test as expected.

- The launch of SFDR was monitored by the senior scientists of various DRDO labs, including Research Centre Imarat, **Defence Research, and Development Authority- DRDL, and High Energy Materials Research Laboratory- HEMRL**.
- The **Union Defence Minister Rajnath Singh** also congratulated the Indian Air Force and the scientists of DRDO on the **successful flight test of Solid Fuel Ducted Ramjet**.

### Technological advantage to DRDO:

- The official statement by DRDO mentioned that the **successful demonstration of SFDR technology** has provided the **Defence Research and Development Organisation** a technological advantage which will enable the government organisation in developing long-range air-to-air missiles.
- It further added that at present this form of technology is currently available only in a handful of countries.

**Flight test of SFDR Technology:** The performance of the missile was monitored with the help of data captured by Radar, Electro-Optical, and Telemetry instruments which were deployed by ITR and confirmed the demonstration of the mission objectives. **During the flight-test**, many new technologies, which included Solid Fuel based Ducted Ramjet Technology was also proven during the test. At the time of the test, air-launch was stimulated with the use of a booster motor. The nozzle-less booster speeded up it to the **required Mach number for the Ramjet operation**.

### Launch of Sindhu Netra Satellite:

- The **Sindhu Netra Satellite** which has been developed by **DRDO** was **successfully deployed in space on February 28, 2021**. The satellite by DRDO is capable of automatically identifying the merchant ships and warships operating in the Indian Ocean Region.

## #ISRO & NASA COLLABORATION: NISAR

- **The Indian Space Research Organisation- ISRO** with the **US space agency NASA** completed the development of a **Synthetic Aperture Radar- SAR** which is capable of producing extremely high-resolution images for a joint Earth observation satellite mission.
- **NASA-ISRO SAR (NISAR) is a joint collaboration between both the space agencies** for a dual-frequency L and S-band SAR for earth observation. NASA and ISRO had signed a partnership in 2014 to collaborate and launch NISAR.
- The **Earth Observation Satellite Mission** has been targeted to launch in early 2022 from the Sriharikota spaceport of ISRO in Andhra Pradesh.

### What is NISAR?

- **NISAR** by both the space agencies will be the first satellite mission to **use two different radar frequencies (S-band and L-band)** for measuring the changes in Earth's surface less than a centimeter across.
- **NASA and ISRO develop radar:** The **National Aeronautics and Space Administration- NASA** has been providing L-band SAR of the mission, GPS receivers, a high-rate communication subsystem for the science data, payload data subsystem, and a solid-state recorder.
- **While ISRO is providing the S-band SAR, the spacecraft bus, the associated launch services, and the launch vehicle for the mission.** Its goal is to make global measurements of the consequences and causes of the land surface changes with the use of advanced radar imaging.

The **National Aeronautics and Space Administration** is an independent agency of the US federal government responsible for the civilian space program, as well as aeronautics and space research. NASA was established in 1958, succeeding the **National Advisory Committee for Aeronautics (NACA)**. The new agency was to have a distinctly civilian orientation, encouraging peaceful applications in space science. Since its establishment, most US space exploration **efforts have been led by NASA**, including the Apollo Moon landing missions, the Skylab space station, and later the Space Shuttle. NASA is supporting the International Space Station and is overseeing the development of **the Orion spacecraft, the Space Launch System, and Commercial Crew vehicles**. The agency is also responsible for the Launch Services Program, which provides oversight of launch operations and countdown management for uncrewed NASA launches.

### Functions of NISAR:

- **NISAR will provide a means of disentangling highly complex processes** ranging from ice sheet collapses to ecosystem disturbances as well as natural hazards including tsunamis, earthquakes, landslides, and volcanoes.
- The mission will be measuring the **Earth's dynamic surfaces, changing ecosystems, and ice masses**. It will provide information about natural hazards, biomass, groundwater, and sea-

level rise and will also support a host of other applications.

- **NISAR will observe the ice-covered and land surfaces of Earth** globally with 12-day regularity, will sample Earth on average every six days for a baseline 3-year mission.
- This will also allow the mission to observe the large range of Earth processes from the **ice sheets and flow rates of glaciers to the dynamics of volcanoes and earthquakes.**

## Use of SAR to produce high-resolution images:

- A **sophisticated information processing technique known as SAR is used by NISAR** in order to produce extremely high-resolution images. The radar will penetrate darkness and clouds which will enable NISAR to collect data day and night in any form of weather.
- Over the multiple orbits, the radar images will be allowing users to track changes in hazard sites and croplands, as well as monitor the ongoing crisis. The **radar images will also be detailed enough to show local changes** and broad enough for measuring regional trends.

## Better understanding of land surface changes:

- As the mission will continue for years, the data collected will allow a better understanding of the **consequences and causes of the land surface changes.** It will also increase the ability to manage the resources and also prepare for global change.
- **NASA will require a minimum of 3 years of operations with the L-band radar and ISRO** will require 5 years of operations with the S-band radar over the target areas in India and the Southern Ocean.

## #CHALLENGES POSED BY ARTIFICIAL INTELLIGENCE

AI can leapfrog us **toward eradicating hunger, poverty and disease** — opening up new and hitherto unimaginable pathways for climate change mitigation, education and scientific discovery.

### Benefits and Potential

- **Multi-sectoral applications:** Already, AI has helped increase crop yields, raised business productivity, improved access to credit and made cancer detection faster and more precise.



- **Boosts Economic Growth:** It could contribute more than **\$15 trillion to the world economy by 2030**, adding 14% to global GDP. Google has identified over **2,600 use cases of “AI for good” worldwide**.
- **Enabler for SDGs:** A study published in Nature reviewing the impact of AI on the **Sustainable Development Goals (SDGs)** finds that AI may act as an enabler on 134 — or 79% — of all SDG targets.

### Concerns and Challenges

- **Big Carbon Footprint:** AI requires massive computational capacity, which means more power-hungry data centres — and a big carbon footprint.
- **Loss of low income jobs:** Robotics and AI companies are building intelligent machines that perform tasks typically carried out by low-income workers: self-service kiosks to replace cashiers, fruit-picking robots to replace field workers, etc. Many desk jobs will also be edged out by AI, such as accountants, financial traders and middle managers.

- **Widens Inequalities:** AI could compound digital exclusion. Without clear policies on reskilling workers, the promise of new opportunities will in fact create serious new inequalities.
- **Strengthen the Divide between North & South:** Investment is likely to shift to countries where AI-related work is already established, widening gaps among and within countries.
- **Can reinforce existing prejudices:** AI-enhanced recruitment engine, based on existing workforce profiles, taught itself that male candidates were preferable to female. **AI facial recognition and surveillance technology discriminating against people of colour and minorities.**
- **Privacy Concerns:** AI also presents serious data privacy concerns. **Cambridge Analytica — algorithms and big data were used to alter voting decisions.**

## Conclusion

- Only a **“whole of society” approach to AI governance** will enable us to develop broad-based ethical principles, cultures and codes of conduct.
- **Given the global reach of AI, such a “whole of society” approach** must rest on a “whole of world” approach.
- Need for multi-stakeholder efforts on global cooperation so AI is used in a manner that is **“trustworthy, human rights-based, safe and sustainable, and promotes peace”**.
- **Digital future cannot be optimized** for good without multi-stakeholder governance structures that ensure the dividends are fair, inclusive, and just.

## #FRANCE LAUNCHED 1<sup>ST</sup> MILITARY EXERCISE IN SPACE

- **France has launched its first military exercises** in space in order to test its ability to defend its satellites as well as other defence equipment from attack amid the **growing competition between the world powers in Earth’s orbit.**

- The **Head of France’s newly created Space Command Michel Friedling** called the space exercises a stress test of the systems and mentioned that the exercises were a first for the French army as well as entire Europe.



- The exercise, **which has been codenamed ‘AsterX’ in the memory of the first French satellite** from the year 1965, will be based on 18 simulated events in an operations room.

## Objective of a military exercise in space:

- At the **time of the exercise, the French military** will be monitoring a dangerous space object as well as a threat to its own satellite from any other foreign power with a considerable space force. According to Friedling, a series of events appear and create threats or crisis situations against the space infrastructure but only this.

## Key Highlights:

- **The German Space and US Space Force agencies** have also been taking part in the **French exercises**. They began on March 8 and will run till March 12, 2021.
- The **Space Command of France** was announced in 2019 and aims to have 500 personnel by the year 2025.
- Investment by France in the space program is set to reach 4.3 billion euros over the budget period of 2019-2025. **It is just a fraction of the amount spent by China or the United States.**

## Stopping the militarization of space:

- The **Defence Minister of France Florence Parly** had stated that our allies and adversaries have been militarizing space.
- She further added that France plans on developing anti-satellite laser weapons and new surveillance capabilities to **close the gaps with rivals Russia, the US, and China.**
- France, in 2018, had accused Russia of trying to intercept the transmissions from a **Franco-Italian satellite that was being used by the armies of France and Italy** for secure communications. Louch-Olymp, the Russian satellite, had allegedly approached the **Athena-Fidus satellite in what France called 'an act of espionage'.**

## #CHINA & RUSSIA TO BUILD INT. LUNAR RESEARCH STATION

China and Russia have agreed to build a **International Lunar Research Station (ILRS)**, possibly on the moon's surface, marking the start of a new era in space cooperation between the two countries.

- Russia is a part of **International Space Station** which is a **habitable artificial satellite** - the single largest man-made structure in low earth orbit.

## International Lunar Research Station (ILRS):

- **The ILRS is a comprehensive scientific experiment base with the capability of long-term autonomous operation.**
- **The station would be built on the lunar surface and/or on the lunar orbit that would carry out scientific research activities such as the lunar exploration and utilization, lunar-based observation, basic scientific experiment and technical verification.**
- **Russia and China will adhere to the principle of co-consultation, joint construction, and shared**

benefits.

- **They will facilitate** extensive cooperation in the **ILRS**, open to all interested countries and **international partners**.
- Significance: **ILRS will strengthen scientific research exchanges, and promote humanity's exploration and use of outer space for peaceful purposes.**

## Other Programmes Related to Moon:

- **NASA's Artemis:** Earlier, in 2020, **National Aeronautics and Space Administration's (NASA)** published the outline for its **Artemis program**, which plans to **send the next man and first woman to the lunar surface** by the year 2024.
- The **Gateway is an outpost around the Moon** to support human and scientific exploration in deep space.
- **UAE's Rashid:** The United Arab Emirates (UAE) has decided to send an unmanned spacecraft named Rashid to the moon in 2024.
- **China's Chang'e-4 and Chang'e-5 Missions :** Chang'e-4 is the first probe ever to explore the far side of the moon by China.
- Chang'e-5 mission will seek to collect lunar material to help scientists understand more about the moon's origins and formation.

## India's Similar Initiatives:

- **Chandrayaan-3:** India is working on **Chandrayaan-3** which is successor to the Chandrayaan-2 mission and it will likely attempt another soft-landing on the lunar surface.
- **Space Station:** India has set its eye on building its **own space station in low earth orbit** to conduct microgravity experiments in space in 5 to 7 years.

## Reasons for Studying Moon:

- **Understanding Early Earth:** As it is made of remnants of Earth, **clues about the composition of an early Earth** could very well be hidden between layers of Moon dust.
- Further, the Moon holds potential **clues to how life began on Earth**.
- **To Understand Seismic Activity on Earth :** Studying **Moonquakes** can help us understand what seismic activity on Earth could have been like during times with less liquid water on the surface, such as during major ice ages or during the Earth's early history, when the surface was much too hot to preserve liquid oceans.
- **Composition of Earth's Atmosphere:** By measuring **Earth's glow from the Moon**, scientists can accurately estimate how much Earth itself shines, and even the composition of Earth's atmosphere.
- **To Understand Tides, Seasons and Climate:** Measuring the **mass, size and orbital properties of the Moon is essential for predicting** rhythms of **tides and seasons**.
- Studying these **tidal and orbital interactions** between Earth and the Moon is extremely important for understanding possible **effects on Earth's climate**.



**3<sup>RD</sup> JOINT SPACE MISSION: INDIA & FRANCE**

- The **Chairman of ISRO K. Sivan** has informed that **India and France have been working on their third Joint satellite Mission**, even as the bilateral space collaboration has been entering into multiple domains, including the human space flight programme.



- **K. Sivan who is also the Secretary in the Department of Space** mentioned that many French companies are eager to grab the opportunities that are thrown up by the recent reforms into the space sector by the Central Government.

- **As per the ISRO Officials, ISRO and the Space Agency of France CNES** have undertaken two joint missions. One was '**MeghaTropiques**' which was launched in the year 2011 and another one was 'Saral-Altika' launched in 2013.

**Latest joint space mission of India and France:**

- The **officials have informed that CNES and ISRO** have completed the feasibility study for realising the earth observation satellite mission with the thermal infrared imager **TRISHNA-Thermal InfraRed Imaging Satellite for High-Resolution Natural Resource Assessment** and have been working towards finalising an arrangement of implementation for the joint development.

**India-French collaboration in multiple domains of space exploration:**

- Both countries have been working on joint experiments and the accommodation of the scientific instruments in space missions. The collaboration has been expanding to multiple domains including the **human space flight program and space exploration**.
- The **two space agencies** have also finalised all the interface control documents to accommodate the '**ARGOS**' instrument of **CNES in ISRO's OCEANSAT-3 satellite**. The instrument has already delivered to Bengaluru for integration with satellite.
- There are also discussions on establishing '**NavIC**' (**an independent regional navigation satellite system that is developed and maintained by ISRO**) reference station in France. The Scintillation receivers of CNES in India have also been progressing well.
- The **Working Group of ISRO-CNES Human Space Programme** also had discussions on the medical aspects of human spaceflight as well as finalising an implementation arrangement for formalising cooperation in the field of space medicine.

- **Reforms by Indian government benefits the space sector:** According to the Chief of ISRO, because of the recent reforms by the Indian government in the space sector, the **space cooperation between India and France** is expected to grow further involving academia, industries, and research institutes.
- He added that many **French companies plans of making use of reforms and they are soon going to involve.** The reforms will strengthen the space cooperation at the government to government level as well as on the industry to the industry level, as the interaction is going to get a fresh relook in the changing environment.

## #RUSSIA LAUNCHED 38 SATELLITES FROM 18 COUNTRIES

- In a **historic mission, Russia launched 38 foreign satellites on March 22, 2021 aboard Soyuz-2.1a launch vehicle** from the **Baikonur cosmodrome in Kazakhstan.** It was the first fully commercial launch of the Soyuz-2 launch vehicle.
- Nine minutes after a successful takeoff, the upper stage separated from the rest of the spacecraft and, over time, began to insert satellites into their designated orbits. **All the satellites were inserted into three sun-synchronous orbits.**
- The **Russian space agency, Roscosmos** said in a statement that the "**Soyuz-2.1a carrier rocket with the Fregat upper stage and 38 spacecraft from 18 countries took off from the Baikonur cosmodrome.**" It added saying that the main payload is the South Korean satellite #CAS500-1.



## Key Highlights of the Mission

- The **CAS500-1 satellite is a South Korean remote sensing satellite** and it is fitted with a camera, which will provide high-resolution electro-optical images of the Earth.
- **Challenge-1 satellite was also among the 38 satellites.** The satellite is the first one to be made completely in Tunisia. It was created by the Telnet telecommunications group.
- The launch took place on **March 22nd** after being postponed twice. **It was initially supposed to take place on March 20th but was postponed after a surge in voltage was detected.**
- The launch vehicle took off from the **Baikonur Cosmodrome in Kazakhstan**, which is the largest operational space launch facility in the world.
- The **Baikonur Cosmodrome** was initially built in the USSR as the base of the Soviet space

programme. It was later leased by **Russia from the Kazakhstan government** after the fall of the Soviet Union. **The first-ever artificial satellite, Sputnik 1, was launched from the facility.**

## Background

- Ever since the fall of the **Soviet Union in 1990**, the Russian space sector has lagged behind other international competitors including the United States. This was due to several corruption scandals and technological stagnation.
- In an unfortunate situation in 2018, a **Russian Soyuz rocket carrying a Russian cosmonaut and a NASA astronaut failed mid-flight**, forcing the crew to carry out an emergency landing. Both the astronauts survived without injuries.

## #PAKISTAN TEST FIRED SHAHHEN 1-A MISSILE

- **Pakistan has successfully test-fired a nuclear-capable surface-to-surface ballistic missile** on March 26, 2021. Missile has a range of 900 kilometres.
- **Pakistan test-fired Shaheen-1A surface to surface ballistic missile** with the aim of re-validating various design and technical parameters of weapon system including the advanced navigation system.
- According to Army's media wing, **missile has a range of 900 kilometres**. Missile comprise of a sophisticated and advanced guidance system which makes it a highly accurate missile system.
- Launch of the missile was witnessed by senior officials from Strategic Plans Division, scientists & engineers of strategic organisations and strategic forces.



## Background

- **Pakistan had successfully test-fired a nuclear-capable surface-to-surface ballistic missile** in February 2021 which can **strike targets up to 290 kilometres**.
- **Launch of Ghaznavi missile was “culmination of Annual Field Training Exercise of Army Strategic Forces Command”**.
- **Shaheen-I:** It is a land-based supersonic and short-to-medium range surface-to-surface guided ballistic missile of Pakistan.
- It was jointly designed and developed by **joint venture of NESCOM and National Defence Complex (NDC)**. Missile has been dedicated and named after a species of Falcon inhabitant of mountains of Pakistan. It is also designated Hatf IV.

- **It has an optimal range of 750 km** which is propelled by two-stage solid-fuel rocket motor. It can deliver conventional as well as nuclear **payload much faster than liquid fuelled missiles like Ghauri. Missile is believed to be very accurate.**

## Features of Shaheen-I

- This system allows the missile to modify its trajectory, improving accuracy and **provides the capability to evade missile defence systems.** It is based on terminal guidance system technology.
- This technology helps in **improving warhead accuracy by firing small thrusters** to adjust trajectory of warheads. and uses satellite navigation systems to help find the target.

## #FIRST ARAB MARS MISSION: HOPE

- The **United Arab Emirates' space probe** entered **the orbit of Mars on February 9, 2021,** marking a historic moment for the Arab world.
- When the **spacecraft swung into the Martian orbit,** the ground controllers at the UAE's space center in Dubai rose to their feet and broke into applause. This is the **Arab world's first interplanetary mission.**
- **UAE's space probe** called **Al Amal,** which means **'Hope'** in Arabic has finally reached its destination after a **7-month long journey.**



## UAE's Mars Probe

- **UAE's Mars probe** fired its main **engines for 27 minutes** in an intricate and conducted high-stakes maneuver that slowed the craft enough for it to be captured by Mars' gravity. The

**signal signal confirming success of the mission took nail-biting 11 minutes to reach Earth.**

- **UAE's space probe** only comprises an orbiter, which will spend 687 days circling the red planet. The **period equivalent to one year on Mars.**
- During this time, the probe will **gather detailed information on the Martian atmosphere** and will survey the **planet's weather patterns throughout its four seasons.**

## Significance of the mission

- **Al Amal's successful insertion into the Mars orbit** has ushered in a new era of space exploration for the Gulf nation, as it is **UAE's first venture beyond Earth's orbit.**
- It has put the **UAE in a league of just five space agencies** in history that have pulled off a functioning Mars mission.
- There was visible relief when UAE's mission turned out to be a success. **UAE's Mars Mission director Omran Sharaf declared,** "To the people of the UAE and Arab and Islamic nations, we announce the success of the UAE reaching Mars.
- This is the **first space probe to enter the orbit of the Red Planet** out of the total three unmanned Mars probes that took flight last year within days of each other. The remaining two belong to China and the United States.

## US, China Mars Mission.

- The **US and China's space probes** are scheduled to **arrive at Mars** in the next couple of days. All three missions were launched in July 2020, taking advantage of the close alignment of Earth and Mars.
- **Both China and US missions comprise a combination of orbiter and lander.** While the orbiter will circle Mars, the lander will separate and attempt to land on the Martian surface to look for signs of extra-terrestrial life. The **United States Perseverance Rover** will aim to attempt a landing on February 18, while China will attempt a landing in May.
- The **US-European project** aims to bring Mars rocks back to Earth to be examined for evidence of microscopic life. If China is able to successfully land its mission on Mars, it will become the second country in the world to land **successfully on the Red Planet after the United States, which has done it eight times.**
- **NASA had landed its first mission on Mars 45 years ago** and it has a rover and a lander working on the Martian surface currently.

## Background

**Mars has been the graveyard** for a multitude of missions from various countries over the years.

Almost 60 percent of all Mars missions have ended in failure, crashing, burning up or otherwise falling short in a testament to the complexity of **interplanetary travel** and the difficulty of making a descent through Mars' thin atmosphere.

## #LAUNCH OF CHANDRAYAAN-3 DELAYED

- The **Chief of the Indian Space Research Organisation- ISRO K Sivan** informed that India's third mission to the moon, Chandrayaan-3, is likely to be **launched in the year 2022**.



- The **lockdown due to the COVID-19 pandemic has affected several projects of ISRO including Gaganyaan**, the first manned mission of India, and **Chandrayaan-3**, which was earlier scheduled to be launched in 2020.

- **Chandrayaan-3 is also critical for ISRO** as it will be demonstrating the capabilities of India to make landing for the further interplanetary mission. **Chandrayaan- 3**, unlike its predecessor, **will not have an orbiter**.

## Launch of Chandrayaan-3:

- The **ISRO Chief K Sivan while informing about the much-awaited launch** mentioned that the team has been working on it. He added that it is the **same configuration as Chandrayaan-2 but it will not have any orbiter**.
- The **orbiter which was launched during Chandrayaan-2** will be used for **Chandrayaan-3 as well**. With this, the team has been working on a system, and most probably the launch will be in the year 2022.

## Previous launch of Chnadrayaan-2:

- **Chadrayaan-2** was launched on July 22, 2019, and aimed at landing a rover on the uncharted lunar South Pole. It was onboard **the country's most powerful geosynchronous launch vehicle**.
- **However, the lander Vikram hard-landed on September 7, 2019**, crashing the dream of India to become the first nation for successfully landing on the surface of the moon in its maiden attempt.

## Launch of Gaganyaan:

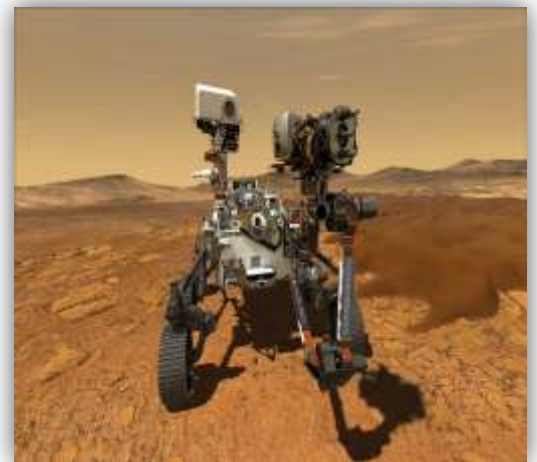
- The **ISRO Chief has informed that the space agency has been targeting December 2021**

for the launch of the first unmanned mission under the **Gaganyaan project**. The mission was earlier scheduled to launch in December 2020.

- While informing about the launch of the third module of **Gaganyaan which will be a manned mission, the ISRO chief said** that a lot of technology needs to be demonstrated. The team will decide on the time (of the manned mission) after checking if all the technology is perfect.
- **Gaganyaan aims at sending three Indians to space by 2022**. The four test pilots who have been selected for the mission have been currently undergoing training in Russia.

## #NASA'S PERSEVERANCE ROVER LANDED ON MARS

- The **science rover Perseverance of NASA landed on the Red Planet (MARS)** on February 18, 2021. This rover is the **most advanced astrobiology laboratory** that has been ever sent another planet.
- It will firstly search the traces of ancient microbial life on the Planet.



### Highlights of the mission

- The **rover sailed through space for nearly seven months**. It covered the distance of **293 million miles or 472 million km before entering to the Martian atmosphere**.
- It **entered the MARS with a speed of 12,000 miles per hour or 19,000 km per hour**. The most challenging part of the robotic vehicle was its self-guided descent and landing during a complex series of maneuver. It was called as 'seven minutes of terror' by NASA.
- The **project is worth \$2.7 billion**. It was launched with the primary aim of launching the bechioenis in order to search for possible fossilized signs of microbes.

### MARS 2020 Mission

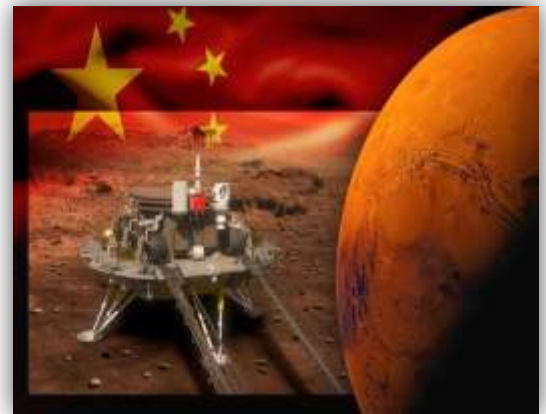
- It is a **Mars rover built by Mars Exploration Program of NASA**. It comprises of the Perseverance rover and an Ingenuity helicopter drone.
- The **mission was launched on an Atlas V 541 launch vehicle** from Earth on July 30, 2020. **The mission was announced by NASA** in December 2012 during a fall meeting of the American Geophysical Union at San Francisco.

### Perseverance rover

- The **rover will observe the astro-biologically relevant** ancient environment on the planet. It will also look after its surface geological processes and history.
- The rover will also do the assessment of past habitability and possibility of past life on it. The design of the rover is **influenced from the Curiosity rover**. It uses components that have been already fabricated and tested. It comprises of 19 cameras and two microphones. Thus, it will **also record the audio of the environment on MARS**.

## #CHINA'S TIANWEN-1 ENTERED MARS ORBIT

- **China's spacecraft 'Tianwen-1'** entered Mars orbit on February 10, 2021, becoming the **world's second one in two days after the United Arab Emirates**.
- Chinese media reported that **China's Tianwen-1 successfully entered the orbit around Mars** after a nearly seven-month voyage from Earth.
- The **Chinese mission to Mars comprises an orbiter and a rover**, which it plans to land on the Red Planet to collect data on underground water and possible signs of ancient life.



### Significance of the mission:

- **China's Mars probe became the second spacecraft** in two days to reach the red planet, following **UAE's Hope space probe** that entered Mars orbit on February 9, 2021.
- The **Chinese mission to Mars** is its most ambitious one yet. If the mission goes as planned, the **rover would separate from the spacecraft in a few months and attempt to touch down**.
- If all goes as planned, China would become the **second nation in the world to land on Mars successfully after the United States**.
- The Chinese spacecraft is named Tianwen, which is the title of an ancient poem and it means **"Quest for Heavenly Truth."**

### China's space programme

- **China's space programme** has progressed considerably since the past couple of years as it attempts to join the space race. **China's Chang'e 5 mission in December 2020 was the first to bring lunar rocks to Earth** since the 1970s
- **China was also the first country to land a spacecraft** on the far side of the moon in 2019. India had attempted to land on the far side of the Moon in the **same year with its Chandrayaan-2 mission** but failed after it lost contact with its lander just minutes before the



scheduled landing.

### Landing on Mars so tricky

- **Landing on Mars has been tricky so far.** The United States is the only nation that has managed to successfully touch down on Mars.
- **The US has managed to land missions on Mars eight times beginning with the two Viking missions.** The nation currently has a lander and rover are in operation on the Martian surface.
- **China's attempt to land on Mars will involve a parachute, back-firing rockets and airbags.** The proposed landing site for the Chinese mission is inside the massive, rock-strewn, Utopia Planitia, where the US Viking 2 lander touched down in 1976.
- **Chinese rover**, which will be solar-powered, is expected to operate for about three months and the orbiter for two years. **The rover will be about the size of a golf cart.**
- **Tianwen-1 is China's second attempt to send a spacecraft to the Red Planet.** China in collaboration with Russia had attempted to send an orbiter to Mars in 2011 but the mission had failed and didn't make it out of Earth orbit.
- Many missions couldn't make it to Mars including a **Russian mission, a European Spacecraft and a failed US lander.**

### Background of the Mars Mission

- In total, **three Mars missions had taken flight in July 2020** within days of each other, taking advantage of the planet's close alignment with Earth that occurs only once in every two years.
- The missions belong to the **United States, United Arab Emirates and China.** While UAE and China's missions have already entered the Mars orbit, the US probe will enter soon.
- The **United States will attempt to land its Perseverance rover on the Martian surface** around February 18, 2021. The mission also aims to search for signs of ancient microscopic life and to collect Martian rocks and bring them back to Earth.
- Six orbiters are currently operating around Mars, **including three of the US**, two European and **one Indian -Mangalyaan.**

**#ISRO LAUNCHES BRAZIL'S AMAZONIA-1 SATELLITE**

- The **Indian Space Research Organisation** on February 28, 2021, launched **Polar Satellites Launch Vehicle- PSLV C51** carrying **Amazonia-1** satellite of **Brazil** and **18 other satellites** of **USA** and **India** from **Satish Dhawan Space Centre** at **Sriharikota**, Andhra Pradesh at 10.24 am.

- During the launch, a **Brazilian delegation** along with **ISRO Chief K. Sivan** was also present at the **Satish Dhawan Space Centre**.



- After four stages of separation, the PSLV rocket launched the Amazonia-1 satellite of Brazil, an optical earth observation satellite.
- The **first space mission of India for 2021** has been one of the longest for PSLV rocket. This is also the **first commercial mission of New Space India Limited**, a company of the Indian government under the Department of Space.
- The **NSIL- New Space India Limited** has been undertaking this mission under a commercial arrangement with Spaceflight Inc. USA.

**About Amazonia-1 Satellite of Brazil:**

- It is an **optical earth observation satellite of the National Institute for Space Research**. The launched satellite will further help in strengthening and reinforcing the existing structure by providing remote sensing data in order to monitor deforestation in the Amazon region.
- It will also provide an analysis of the diversified agriculture **across the territory of Brazil**.

**Launch of PSLV-C51 rocket:**

- The **PSLV-C51, which is the 53rd mission of Polar Satellite Launch Vehicle** launched **Brazil's Amazonia-1 satellite** as the primary satellite. A total of 18 co-passenger satellites were lifted off from the Space Centre.
- The **18 co-passenger satellites launched by PSLV** include four from IN-SPACe. Out of 4, 3 are from UNITYsats from the consortium of the three Academic Institutes of India and 1 Satish Dhawan Satellite from Space Kidz India). The other **14 satellites are from New Space India Limited**.
- It also includes an engraved picture of **PM Modi which symbolizes his initiative of Atmanirbharata** and space privatization. An e-copy of Bhagavad Gita which is saved on an SD card is also a part of the package.

- The **Chief of the Indian Space Agency K. Sivan congratulated the Brazilian team** on the launch of PSLV-C51 carrying the Amazonia-1 satellite of Brazil along with 18 satellites.
- The ISRO Chief stated that India and Brazil feel proud of the successful launch of the satellite. It is Brazil's first satellite which is designed, integrated, and operated by the **country's space centre; he further congratulated the Brazilian team for the achievement.**

### Beginning of stronger relations between India and Brazil:

- The **Minister for Science, Technology, and Innovation, Brazil, Marcos Ceaser Pontes** during his address at the launch event mentioned that the country was working on this satellite for many years and that it will serve a very important mission for Brazil.
- He further added that the launch of a satellite from **India's PSLV has marked the beginning of stronger relations between India and Brazil** and that there can be no better place than India to further grow the partnership between the two nations.