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Mangalyaan (Mars Orbiter Mission)

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Mangalyaan (Mars Orbiter Mission)

Practice: 8 MCQs

At a glance

The first Indian trip to another planet

01 **Launch**PSLV-C25 lifted off from Sriharikota on 5 November 2013.
02 **Arrival**The spacecraft entered Mars orbit on 24 September 2014.
03 **Rank**PIB called ISRO the fourth space agency to reach Mars orbit.
04 **Cost**ISRO gives Rupees 450 crore. Dollar figures differ by source.

- It was an orbiter. It did not land.
- Five payloads: MCC, TIS, MSM, MENCA and LAP.
- Planned life was six months. ISRO says it worked for about eight years.

OrbiterA spacecraft that circles a planet instead of landing on it.
Hohmann transferA fuel-saving two-burn elliptical path between two roughly circular orbits in the same plane. It is the usual simple model for Earth to Mars travel.
MOIMars Orbit Insertion, the burn that lets Mars capture the craft.
PayloadThe science instruments a spacecraft carries.

India's Mars Orbiter Mission was the country's first trip to another planet. It reached Mars orbit in 2014 and worked far longer than planned. This lesson covers why Mars was chosen and how the spacecraft got there. It also covers what it carried, what it found and how it ended. Where sources give different numbers, both numbers are shown.

Contents

1. Why Mars
2. Launch and cruise
3. Arrival at Mars
4. The spacecraft and its cost
5. Instruments and findings
6. How long it lasted
7. The exam checklist
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9. 7 understanding checks
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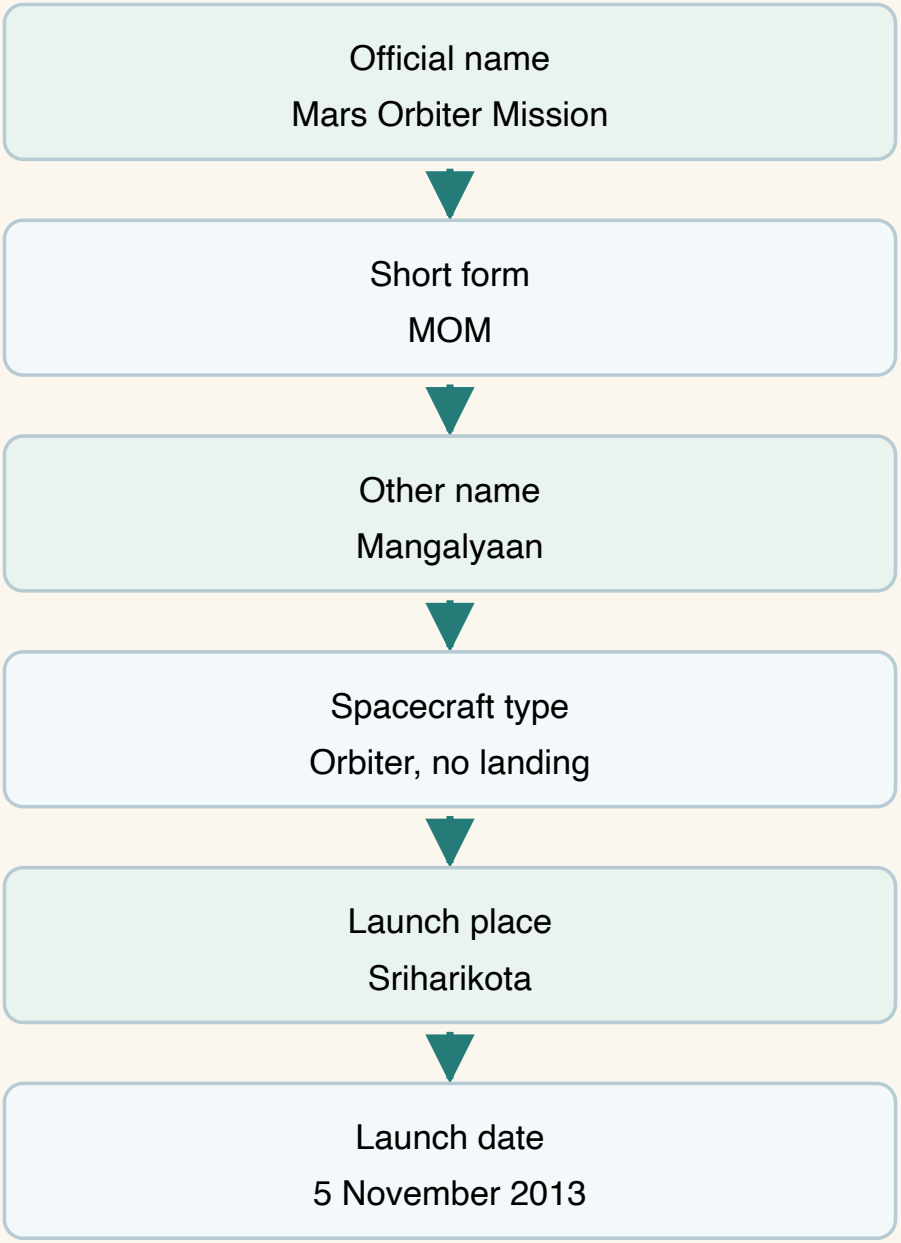
Why did India go to Mars, and what was the real goal?

Start with the reason for the trip. Then see what ISRO wanted to prove.

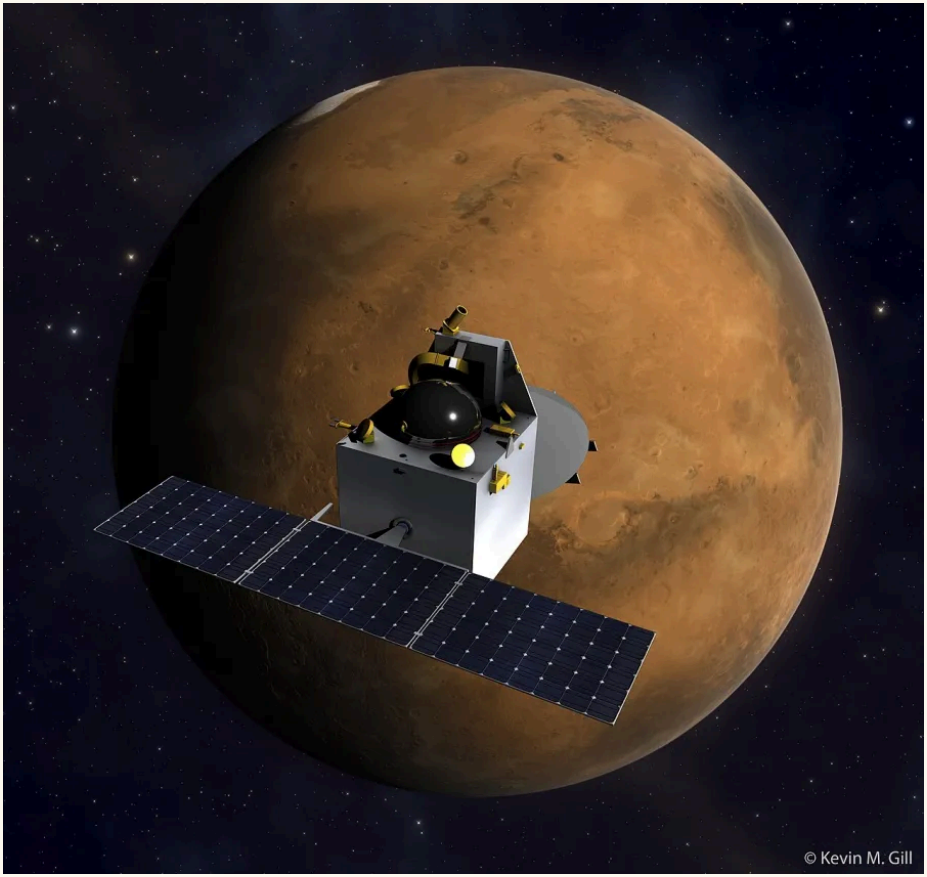
1. What is the Mars Orbiter Mission, and what else is it called?

The Mars Orbiter Mission is India's first interplanetary mission. It is often shortened to MOM. ISRO's own FAQ gives the other name, Mangalyaan. Both names mean the same spacecraft.

The spacecraft was a probe that circled Mars. It did not land. ISRO launched it from Sriharikota on 5 November 2013.



Both names point to one spacecraft. Original explanatory diagram.



Computer-rendered illustration of the Mars Orbiter Mission spacecraft above Mars, by Kevin M. Gill (CC BY-SA 2.0), Wikimedia Commons.

Source: ISRO, FAQ on the Mars Orbiter Mission (item 1)

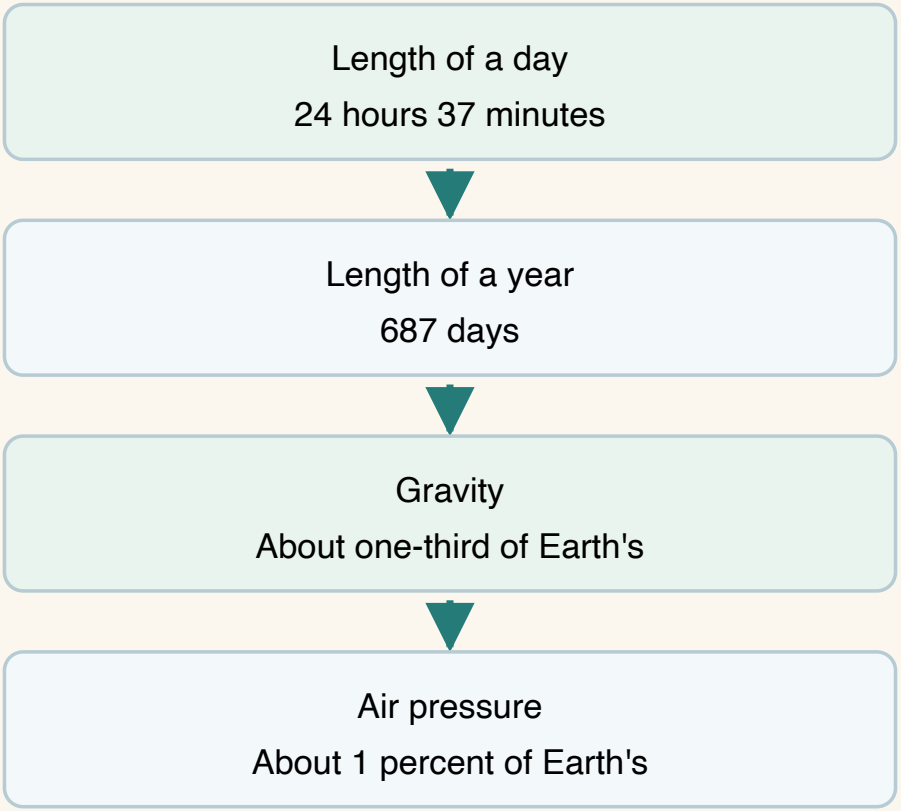
Source: ISRO, Mars Orbiter Mission page (item 1)

2. Why did India choose Mars?

ISRO says Mars gives scientists a chance to study conditions on another planet. Its release statement lists some basic Mars facts.

- A Mars day is **24 hours and 37 minutes** long.
- Mars takes **687 days** to go round the Sun.

- Its gravity is about **one-third** of Earth’s gravity.
- Its air pressure is about **1 percent** of Earth’s.



Weak gravity and thin air shape every Mars mission. Original explanatory diagram.

Source: Arunan and Satish, Current Science 2015 (item 2)

Source: ISRO, Mars Orbiter Mission page (item 2)

Source: ISRO, Long Term Archive release statement (item 2)

3. Was the mission mainly about science?

No. ISRO says the objectives were **“primarily technological”**. The main goal was to show that India could build and fly a Mars spacecraft.

The technology goals were these.

- Build an orbiter that could survive the Earth-bound burns, the long cruise and the Mars orbit.
- Capture the spacecraft into Mars orbit.
- Handle deep-space communication, navigation and mission planning.
- Add on-board autonomy to handle faults without waiting for Earth.

The science goals came second. They were to study Mars’s surface features, minerals and atmosphere with Indian instruments.

Technology first	Science second
Build the orbiter	Surface features
Capture into orbit	Minerals
Deep-space links	The atmosphere
On-board autonomy	

ISRO's own word for the aim is primarily technological. Original explanatory diagram.

True or False: The main goal of the Mars Orbiter Mission was to land on Mars.
Source: ISRO, Mars Orbiter Mission page (item 3)

Source: Arunan and Satish, Current Science 2015 (item 3)

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 3)

How did the spacecraft leave Earth?

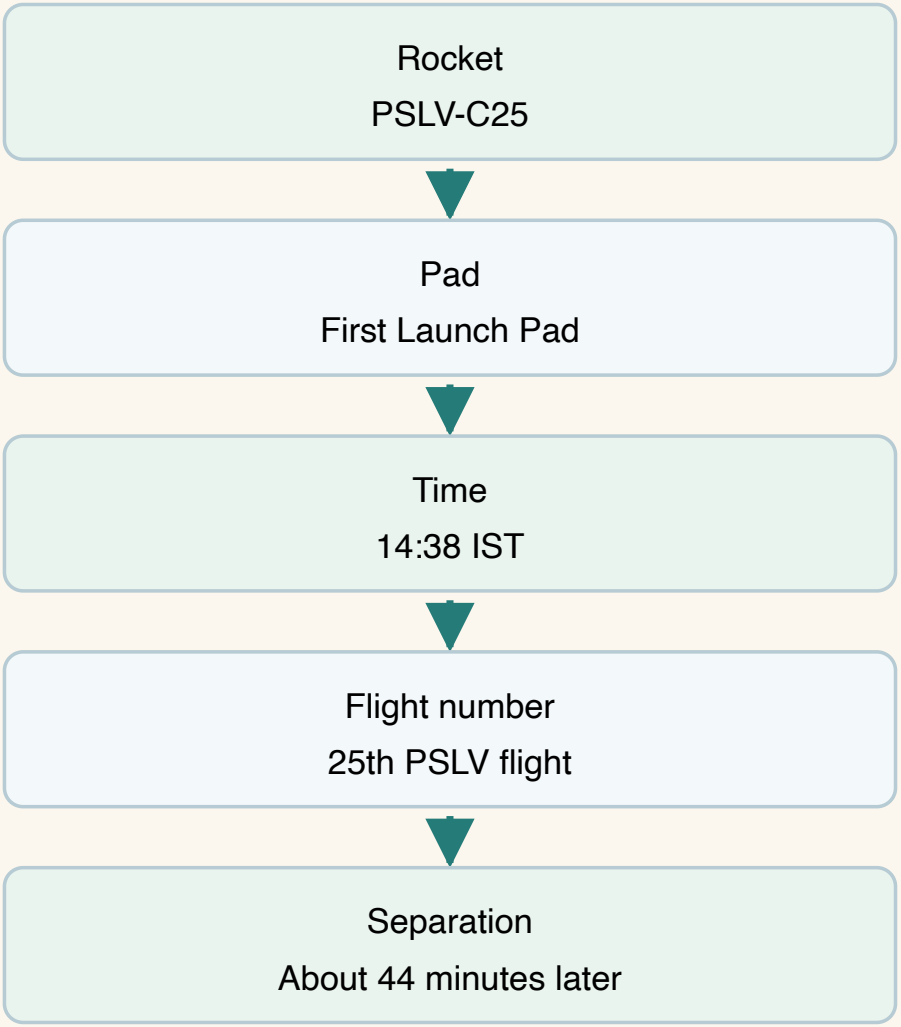
The trip had three parts. First came the launch and the climb out of Earth’s pull. Then came a long cruise. Last came the capture at Mars.

4. When and how was the spacecraft launched?

PSLV-C25 lifted off on **5 November 2013** at 14:38 IST. The launch facts are below.

- Place: the First Launch Pad at the Satish Dhawan Space Centre, Sriharikota.
- Flight: the 25th flight of the PSLV.
- Separation: about 44 minutes after lift-off.

After separation, the rocket's job was over. The spacecraft's own engine had to do the rest.



After separation the spacecraft's own engine took over. Original explanatory diagram.



A PSLV rocket lifting off from Sriharikota (the PSLV-C11 launch of Chandrayaan-1, 2008), NASA (public domain), via Wikimedia Commons.

Source: ISRO, PSLV-C25 (item 4)

Source: Arunan and Satish, Current Science 2015 (item 4)

Source: PIB, launch of the spacecraft, 2014 (item 4)

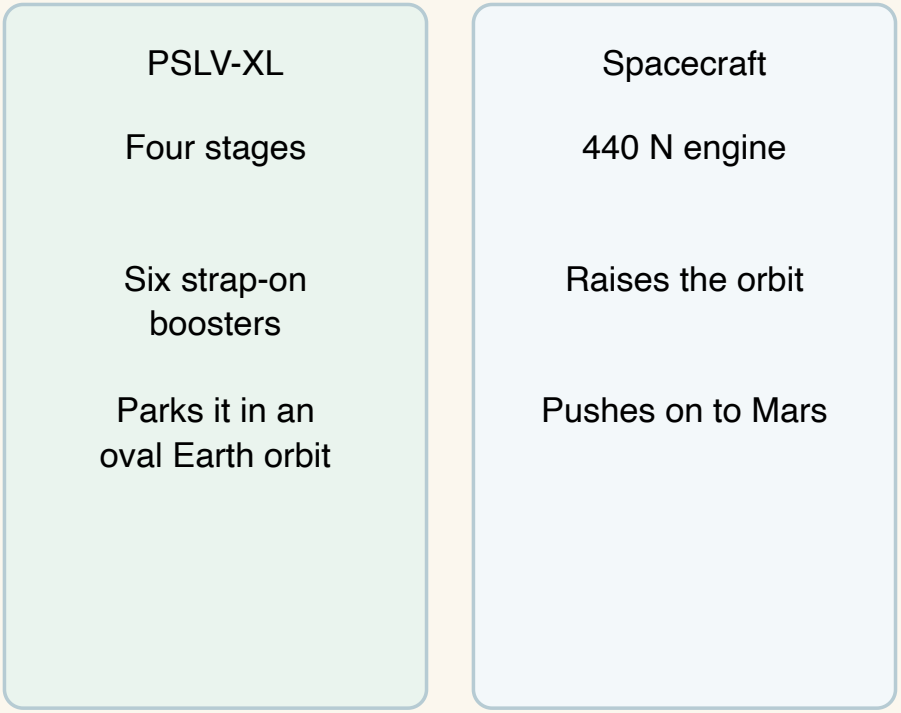
Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 4)

5. Which rocket carried it, and what does "XL" mean?

The rocket was the PSLV, in its extended form. That form is called **PSLV-XL**. The Current Science paper says “PSLV-XL, designated as PSLV-C25”.

The PSLV has four stages that alternate between solid and liquid fuel. The XL version adds six strap-on boosters. ISRO’s table lists the first stage and the strap-on motors as solid-fuel stages.

The PSLV could not send the spacecraft all the way to Mars. It only placed it in an oval orbit around Earth. The spacecraft’s own engine did the rest.



The rocket could not send it all the way. Original explanatory diagram.



A Polar Satellite Launch Vehicle (PSLV), by Ank Kumar (CC BY-SA 4.0), Wikimedia Commons.

True or False: The PSLV rocket carried the spacecraft all the way to Mars.
Source: ISRO, PSLV-C25 (item 5)

Source: Arunan and Satish, Current Science 2015 (item 5)

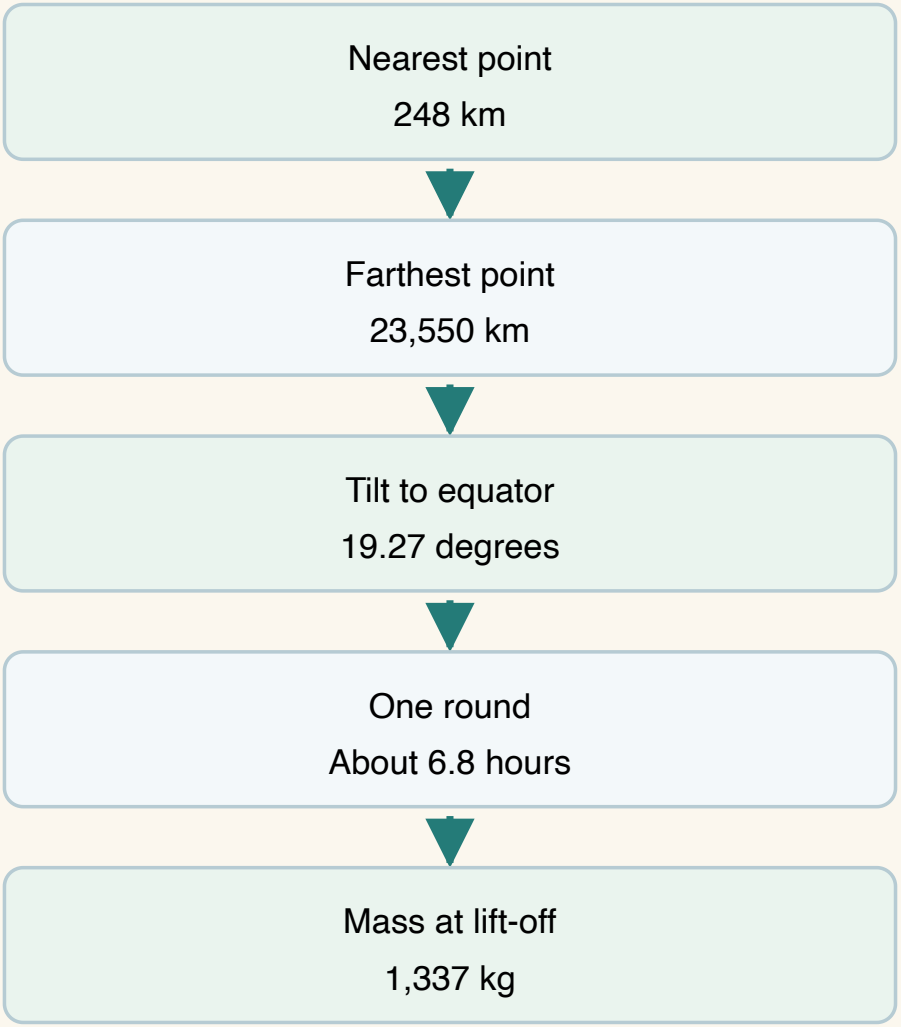
Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 5)

6. What was the first orbit around Earth?

The rocket put the spacecraft into an oval “parking orbit” around Earth. Its nearest point was 248 km above Earth. Its farthest point was 23,550 km.

- Inclination to the equator: 19.27 degrees.
- Time for one round of Earth: about 6.8 hours.
- Spacecraft mass at lift-off: 1,337 kg.

ISRO’s pre-launch page planned for about 250 km by 23,500 km. The achieved numbers are the 248 km and 23,550 km above.



ISRO's plan was about 250 km by 23,500 km. Original explanatory diagram.

Source: Arunan and Satish, Current Science 2015 (item 6)

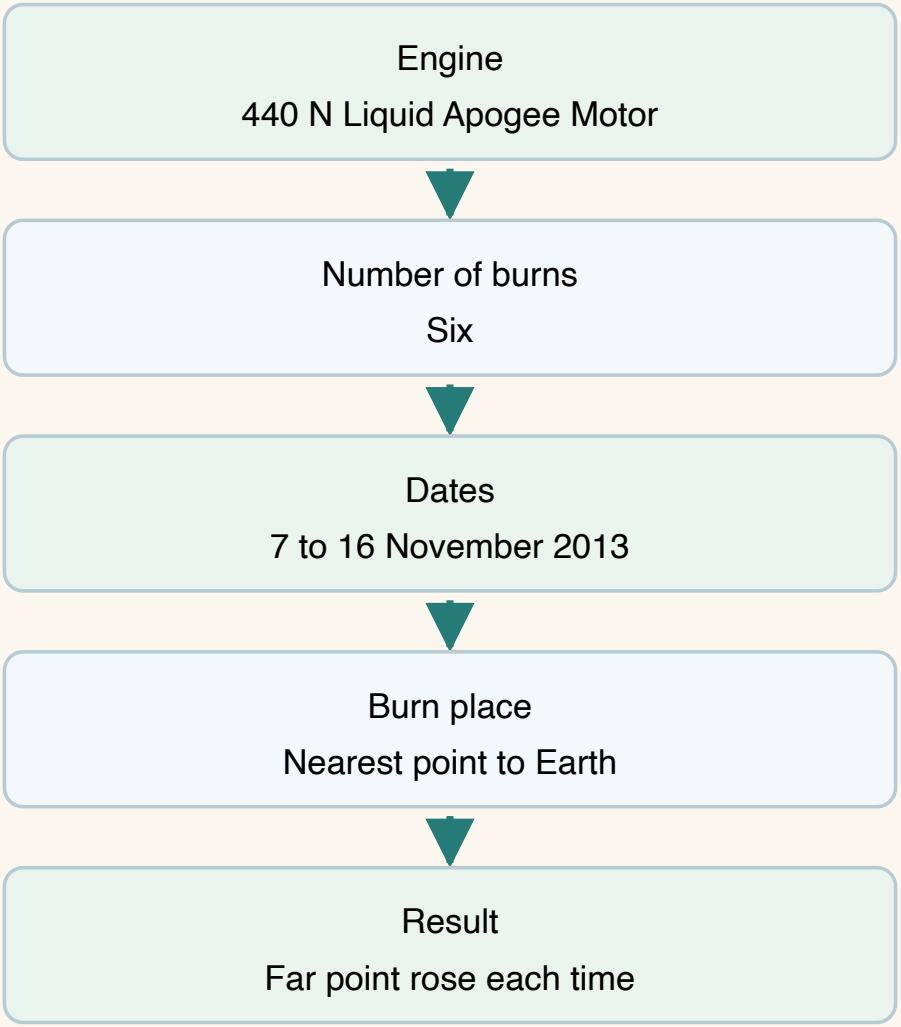
Source: ISRO, PSLV-C25 (item 6)

7. How did the spacecraft climb out of Earth's pull?

This step is called orbit raising. The spacecraft fired its main engine **six times**. The engine is the 440 N Liquid Apogee Motor, or LAM.

- The burns ran from 7 to 16 November 2013.
- Each burn pushed the far point of the orbit higher.
- The far point rose with each burn, to a very high oval orbit.

Each burn happened at the orbit’s nearest point to Earth.



All six burns used the same engine. Original explanatory diagram.

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 7)

Source: ISRO, Mars Orbiter Mission Profile (item 7)

Source: ISRO, Long Term Archive release statement (item 7)

8. What is Trans-Mars Injection, and when did it happen?

Trans-Mars Injection is the burn that sends a spacecraft away from Earth toward Mars. It is shortened to TMI. ISRO fired the LAM for it in the early hours of 1 December 2013.

PIB says the spacecraft escaped Earth's orbit after this burn. It left Earth's sphere of influence on 4 December 2013. ISRO's profile page puts the edge of that sphere at 918,347 km from Earth.

After that, the Sun's pull mattered more than Earth's. The spacecraft was now on a path around the Sun.



From here the Sun's pull ruled the path. Original explanatory diagram.

Source: PIB, spacecraft inserted into Mars orbit, 2014 (item 8)

Source: PIB, launch of the spacecraft, 2014 (item 8)

Source: ISRO, Mars Orbiter Mission Profile (item 8)

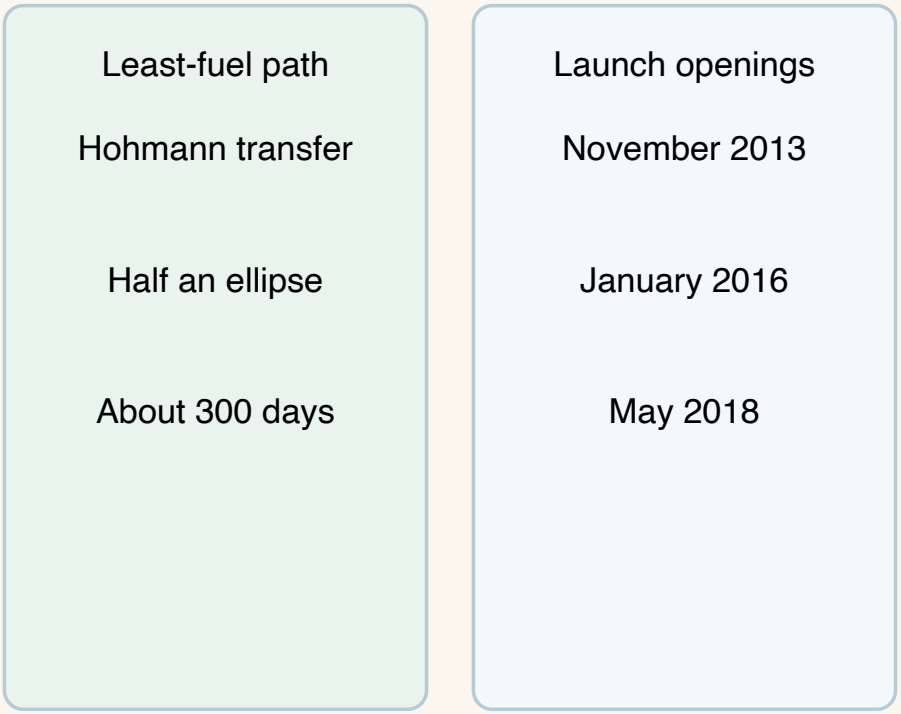
Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 8)

9. Why did the cruise take about 300 days?

ISRO chose a fuel-saving path. This is called a **Hohmann Transfer Orbit**, or a Minimum Energy Transfer Orbit. In this simple model, it is the path that uses the least fuel between the two planets' orbits. The path is roughly half an ellipse around the Sun.

Such a path works only when Earth, the Sun and Mars line up in a certain way. That match comes back about every 780 days. ISRO lists the openings as November 2013, January 2016 and May 2018.

That is why India launched in November 2013. ISRO says the cruise lasted about 300 days.



The Earth-Mars match returns about every 780 days. Original explanatory diagram.

True or False: The cruise of about 300 days followed the path that uses the least fuel.
Source: ISRO, Mars Orbiter Mission Profile (item 9)

Source: ISRO, Mars Orbiter Mission page (item 9)

Source: ISRO, update on the national meet, 2022 (item 9)

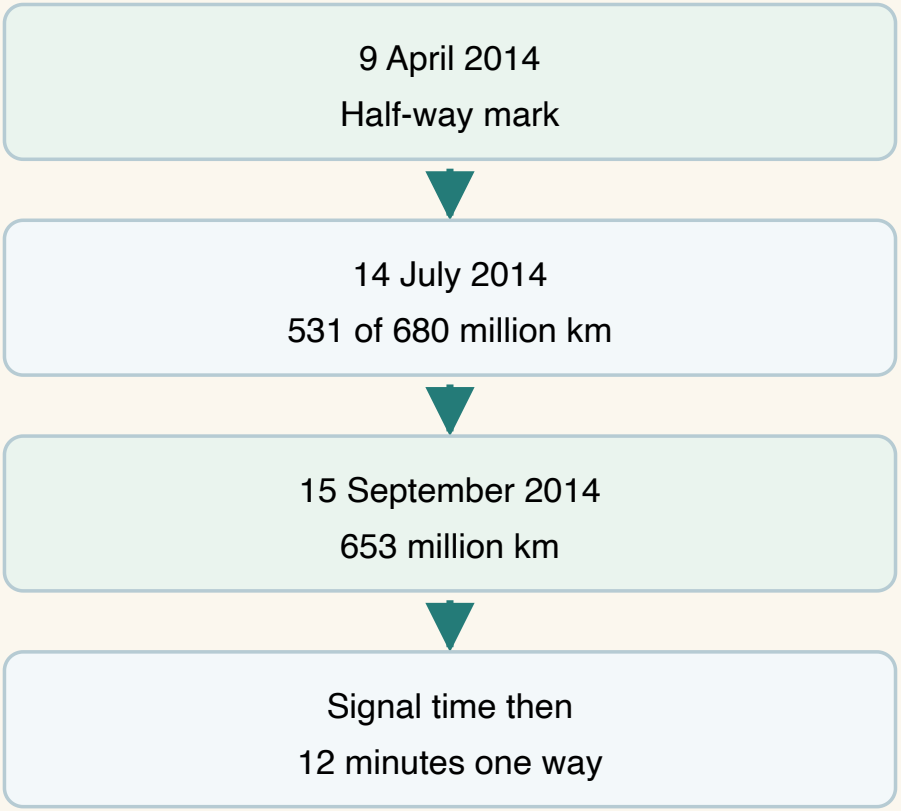
10. What happened during the cruise?

PIB gave a progress report in July 2014. By 14 July 2014 the spacecraft had covered about 531 million km of a 680 million km path. All systems were working normally.

ISRO's illustrated book adds more points.

- The spacecraft crossed the half-way mark on 9 April 2014.
- By 15 September 2014 it had covered about 653 million km.
- On that day a radio signal took 12 minutes to reach it.

Distance made control from Earth slow. So the spacecraft carries "autonomy" features. It can spot some of its own faults and fix them.



Autonomy kept the craft safe between commands. Original explanatory diagram.

Source: PIB, launch of the spacecraft, 2014 (item 10)

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 10)

Source: Arunan and Satish, Current Science 2015 (item 10)

What happened at Mars on 24 September 2014?

This was the make-or-break moment. The spacecraft had to slow down at exactly the right time.

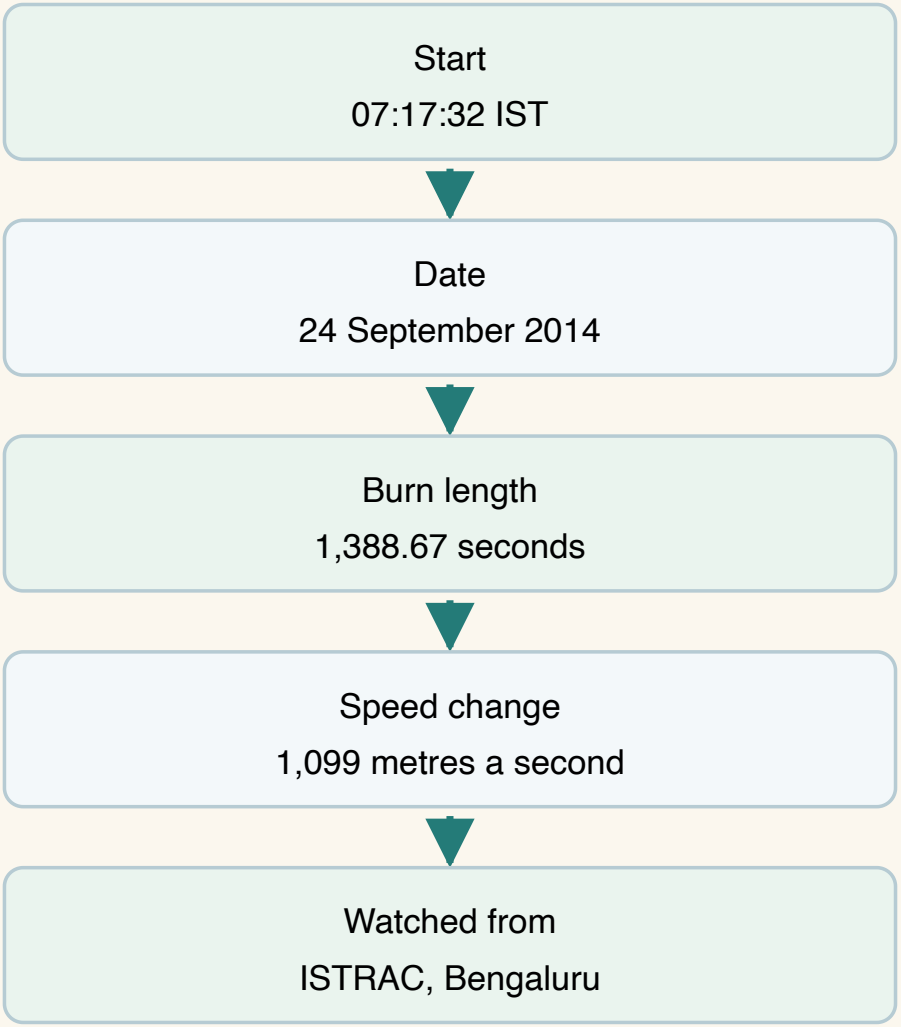
11. What happened on 24 September 2014?

The spacecraft entered an orbit around Mars on **24 September 2014**. It fired its 440 N engine along with eight smaller liquid engines. The burn began at 07:17:32 IST.

- The burn lasted 1,388.67 seconds, or about 23 minutes.
- It changed the spacecraft's speed by 1,099 metres per second.
- Prime Minister Narendra Modi watched from ISRO's ISTRAC centre in Bengaluru.

The burn slowed the spacecraft. This is called Mars Orbit Insertion, or MOI.

PIB's own explainer in 2026 misprints the date as 23 September. PIB's press release on the day says 24 September.



Every figure here comes from PIB or ISRO. Original explanatory diagram.

True or False: Mars Orbit Insertion took place on 24 September 2014.
Source: PIB, spacecraft inserted into Mars orbit, 2014 (item 11)

Source: PIB, PM witnesses the insertion, 2014 (item 11)

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 11)

Source: PIB, India's Space Odyssey explainer (item 11)

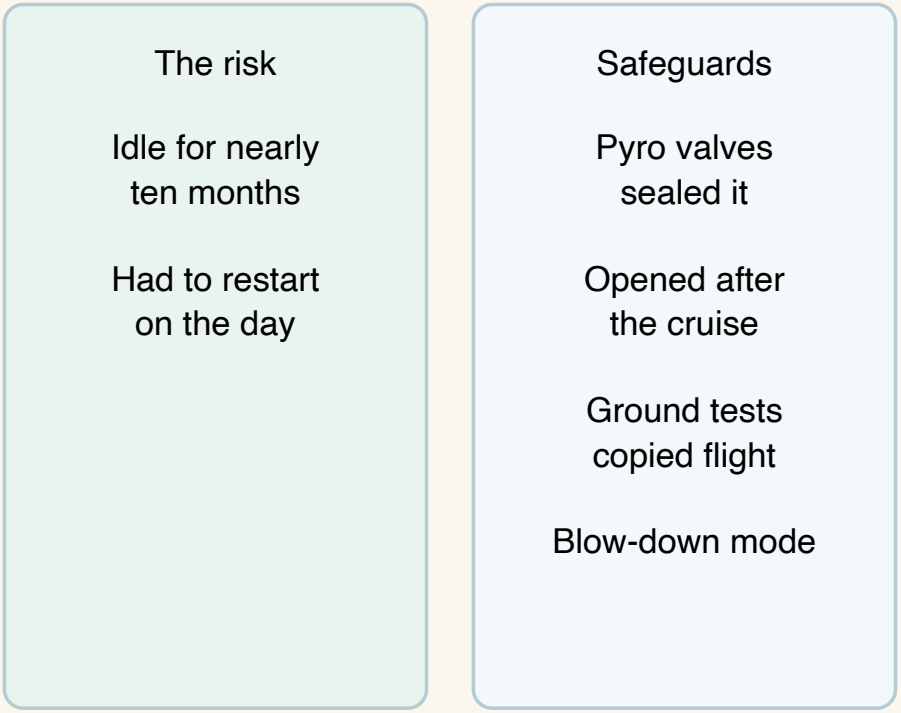
12. Why was the orbit insertion so risky?

The main engine had sat idle for nearly ten months. It had to restart on the day.

ISRO took steps to protect the engine.

- The engine was sealed off with pyro valves after the Earth-bound burns.
- The valves were opened again after the cruise.
- Ground tests copied the flight conditions.

The burn was done in “blow-down” mode. The propellant was pushed out by the gas already in the tanks. The signal delay also meant the spacecraft had to manage itself.



The restart was tested on the ground first. Original explanatory diagram.

Source: Arunan and Satish, Current Science 2015 (item 12)

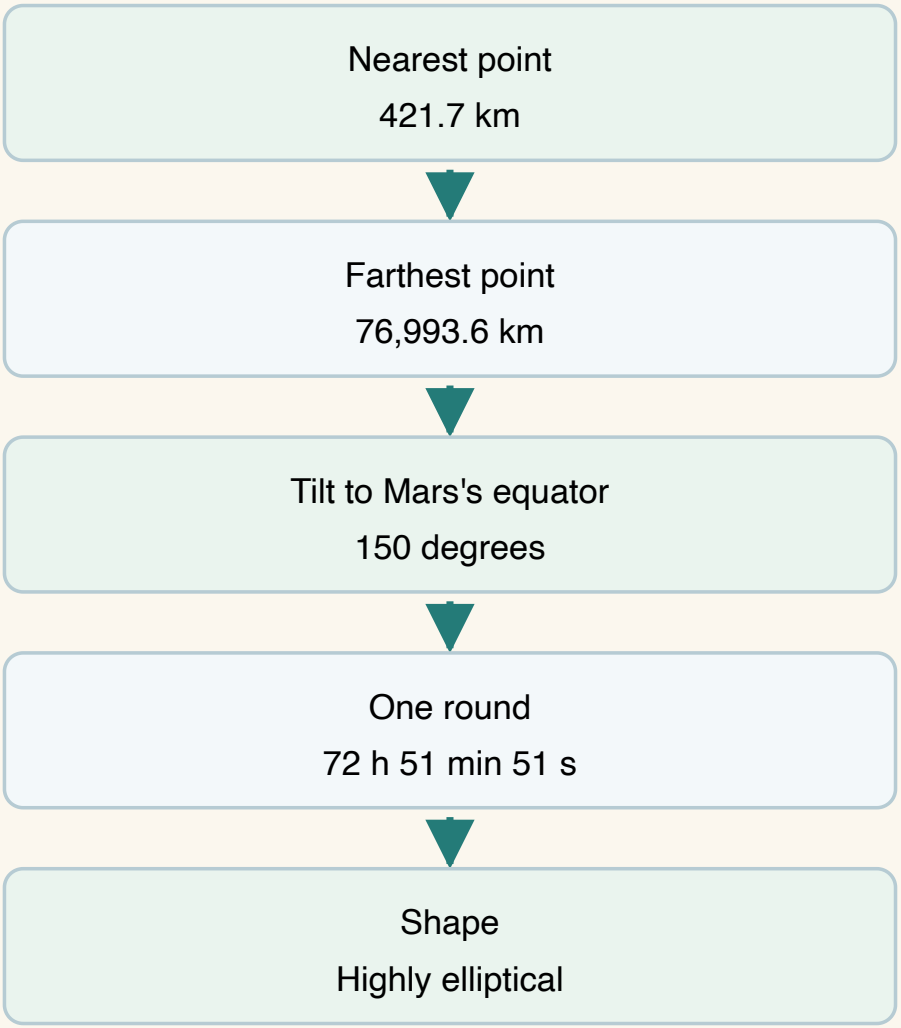
13. What orbit did the spacecraft enter?

PIB gave the first orbit numbers on 24 September 2014.

- Nearest point (periapsis): 421.7 km.
- Farthest point (apoapsis): 76,993.6 km.
- Tilt to Mars’s equator: 150 degrees.
- Time for one round: 72 hours 51 minutes 51 seconds.

The orbit was very oval, so it was highly elliptical. That let the camera see the whole planet from far away. It could also see small areas from close up.

The orbit later changed. ISRO now describes it as about 300 km by about 71,000 km. One round takes about 73 hours. A 2016 ISRO release gave 343 km by 71,191 km.



ISRO later describes about 300 km by 71,000 km. Original explanatory diagram.

Source: PIB, spacecraft inserted into Mars orbit, 2014 (item 13)

Source: ISRO, Overview of the Mars Orbiter Mission (item 13)

Source: ISRO, Long Term Archive release statement (item 13)

Source: ISRO, Mars Orbiter Mission page (item 13)

14. Was India really the only country to succeed on its first try?

ISRO and the Prime Minister say India was the first country to reach Mars orbit on its first attempt. ISRO's illustrated book goes further. It says India is "the only country" to achieve total success in its very first attempt.

An outside check makes the claim more careful.

- NPR, quoting the Associated Press in 2013, noted that no country had yet reached Mars on its first try.
- ESA's Mars Express was Europe's first Mars mission. It entered orbit on 25 December 2003. Its lander, Beagle 2, was lost.

So the safe wording is that India was the first Asian country to reach Mars orbit, and did so on its first attempt. PIB's 2026 explainer uses the phrase "first Asian nation". The word "only" is ISRO's own phrase, not a settled fact. See Source disagreements.

Safe wording	ISRO's book
First Asian country in Mars orbit	India is the 'only country' to succeed
Reached on its first attempt	Europe's first Mars try was 2003

Quote the safe wording in answers. Original explanatory diagram.

Source: ISRO, Long Term Archive release statement (item 14)

Source: PIB, PM witnesses the insertion, 2014 (item 14)

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 14)

Source: NPR, Why India's Mars Mission Is So Much Cheaper, 2013 (item 14)

Source: ESA, Mars Express overview (item 14)

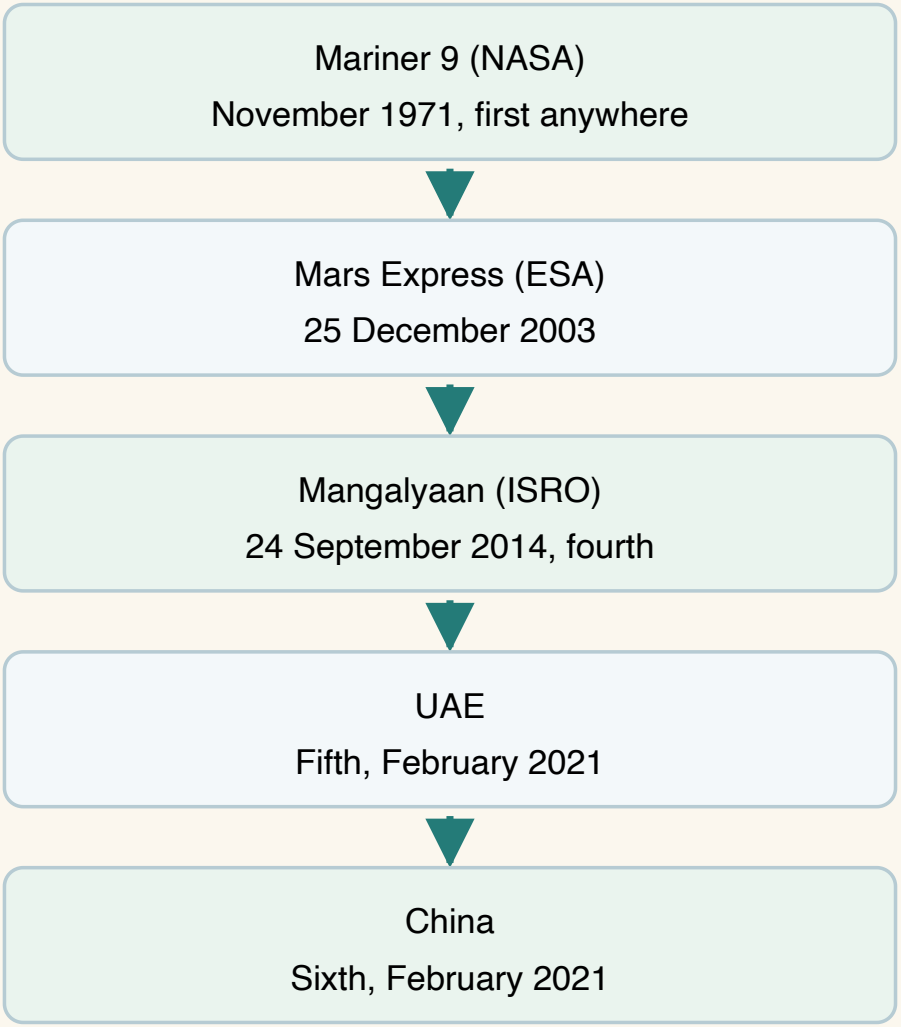
Source: PIB, India's Space Odyssey explainer (item 14)

15. Who reached Mars before India?

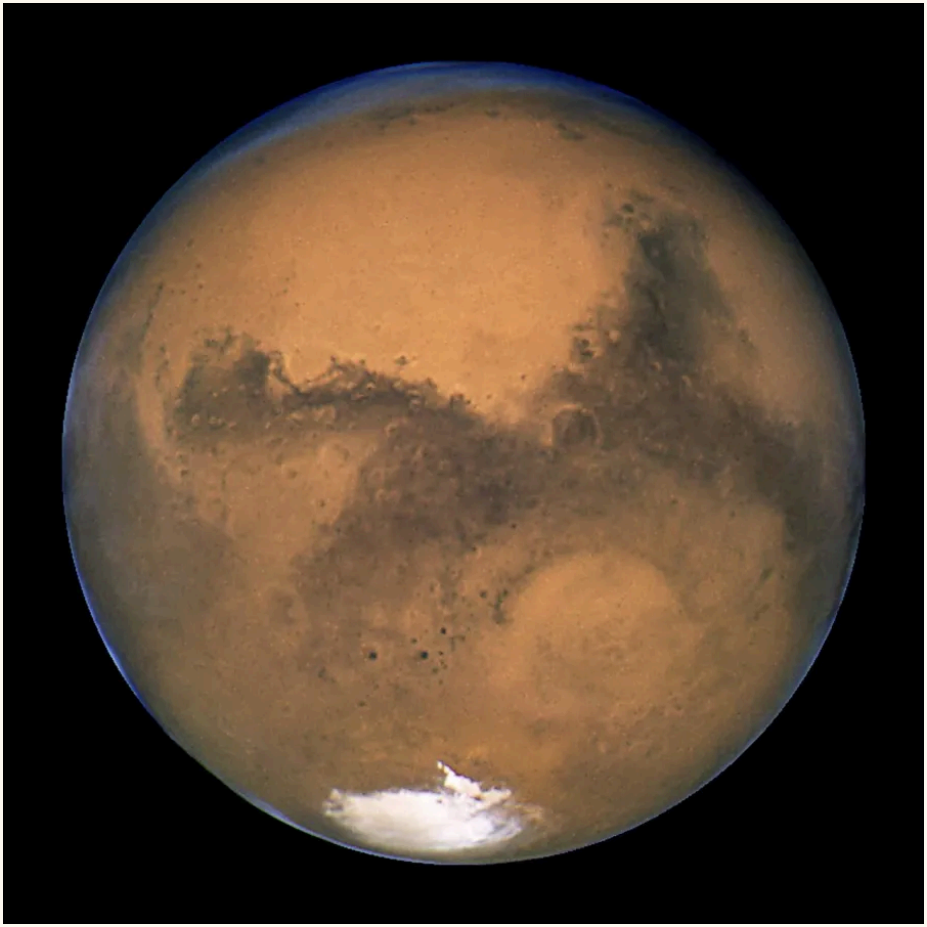
PIB said that ISRO became **“the fourth space agency”** to send a spacecraft to Mars orbit. India was not the second country after the USA. The three before it were the United States, the Soviet Union and the European Space Agency.

- NASA’s Mariner 9 was the first spacecraft to orbit another planet. It reached Mars in November 1971.
- NASA says Mariner 9 beat the Soviet Mars 2 to the planet.
- ESA’s Mars Express entered orbit on 25 December 2003.

Two more came after India. Space.com reported that the UAE became the fifth entity and China the sixth, in February 2021.



The Soviet Union also arrived before India. Original explanatory diagram.



Mars photographed by the Hubble Space Telescope in August 2003, NASA, ESA and the Hubble Heritage Team (public domain), via Wikimedia Commons.

True or False: India was the second space agency to reach Mars orbit.
Source: PIB, spacecraft inserted into Mars orbit, 2014 (item 15)

Source: NASA, Mariner 9 (item 15)

Source: ESA, Mars Express overview (item 15)

Source: Space.com, India's second Mars mission (item 15)

Source: Space.com, UAE Hope probe enters orbit (item 15)

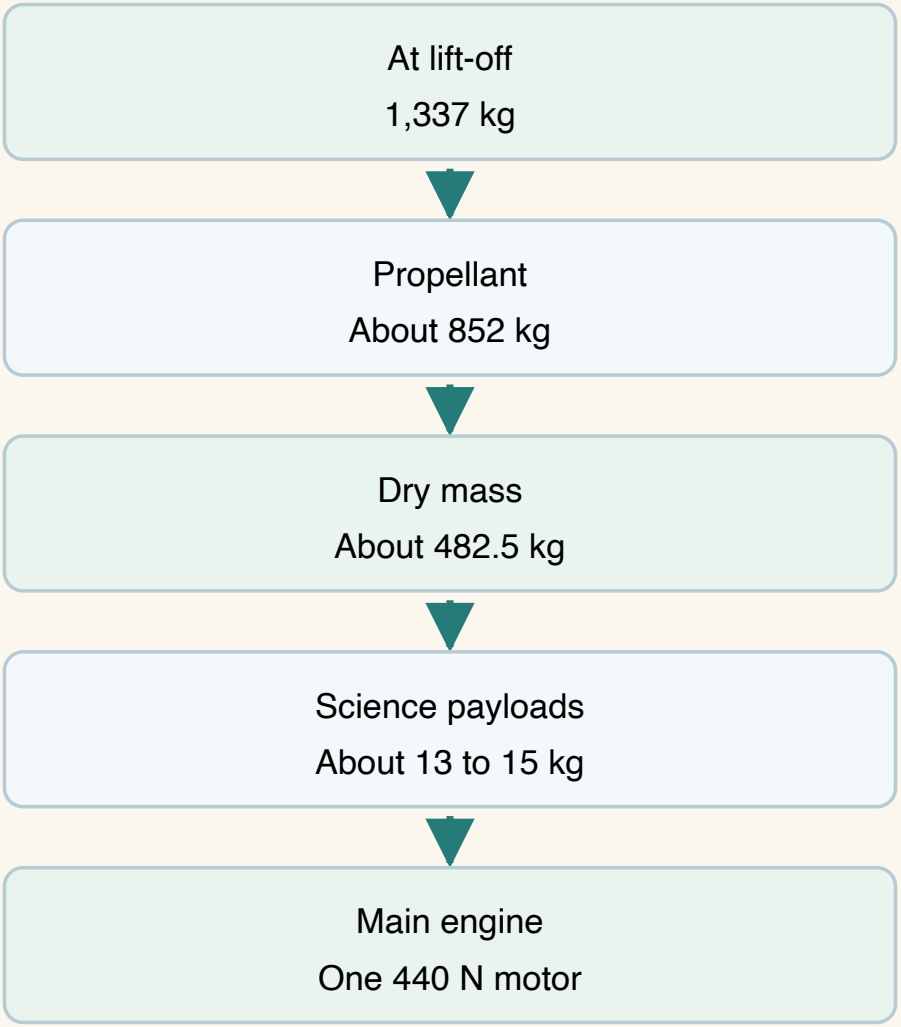
Source: Space.com, Tianwen-1 enters orbit (item 15)

What was the spacecraft, and what did it cost?

16. How big was the spacecraft?

The spacecraft weighed **1,337 kg** at lift-off. About 852 kg of that was propellant. The dry mass was about 482.5 kg. The scientific payloads weighed only about 13 to 15 kg together.

- Main engine: one 440 N Liquid Apogee Motor.
- Small thrusters: eight, of 22 N each.
- Propellants: MMH and N2O4, in titanium tanks of 390 litres each.



The instruments were a tiny part of the weight. Original explanatory diagram.



The Mars Orbiter Mission spacecraft inside the open rocket payload fairing before encapsulation, by Indian Space Research Organisation (CC BY-SA 4.0), Wikimedia Commons.

Source: Arunan and Satish, Current Science 2015 (item 16)

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 16)

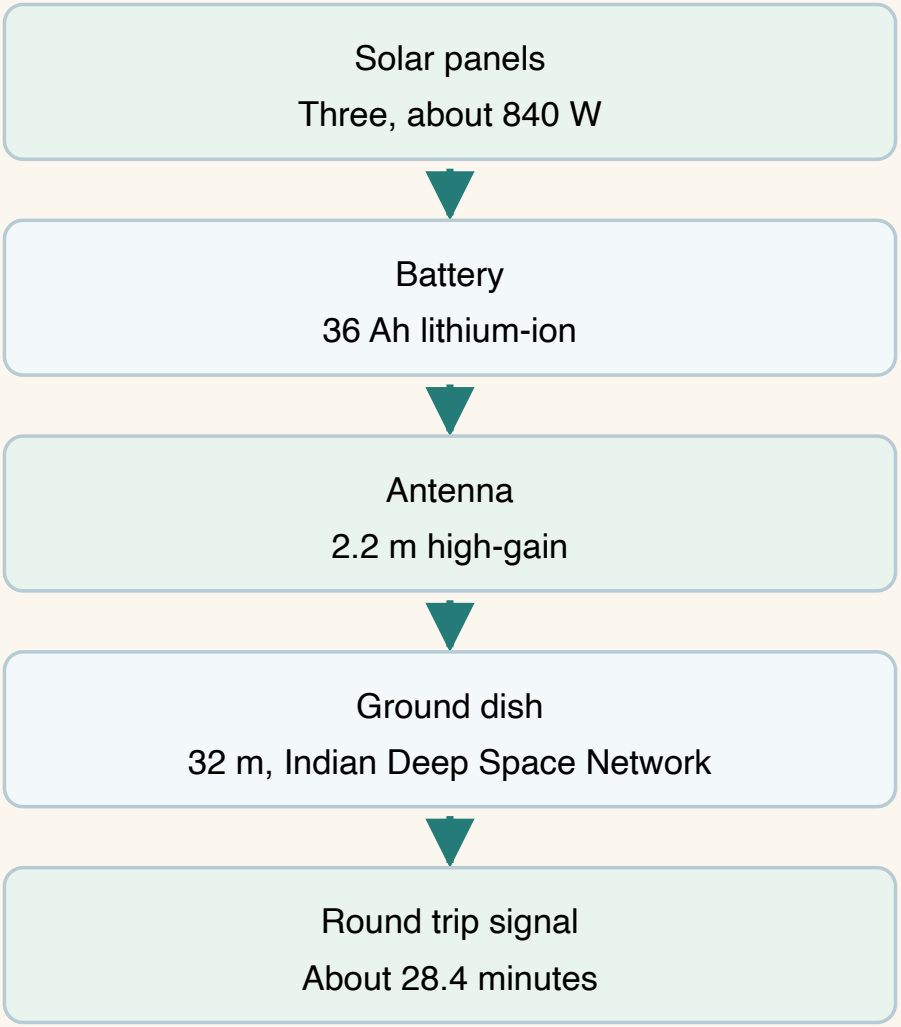
Source: ISRO, Long Term Archive release statement (item 16)

17. How did it get power and talk to Earth?

Three solar panels made about 840 W of power in Mars orbit. A 36 Ah lithium-ion battery powered the spacecraft during burns and eclipses. Sunlight at Mars is much weaker than at Earth.

For radio links, the spacecraft used a 2.2 m high-gain antenna. On the ground, ISRO used a 32 m station of the Indian Deep Space Network.

The round-trip radio time to Mars averages about 28.4 minutes. So the spacecraft had to act on its own during blackouts. Examples are when Mars hid it, or when the Sun blocked the signal.



Distance forced the spacecraft to act alone. Original explanatory diagram.

True or False: A radio signal takes the same time to reach the spacecraft all year round.
Source: Arunan and Satish, Current Science 2015 (item 17)

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 17)

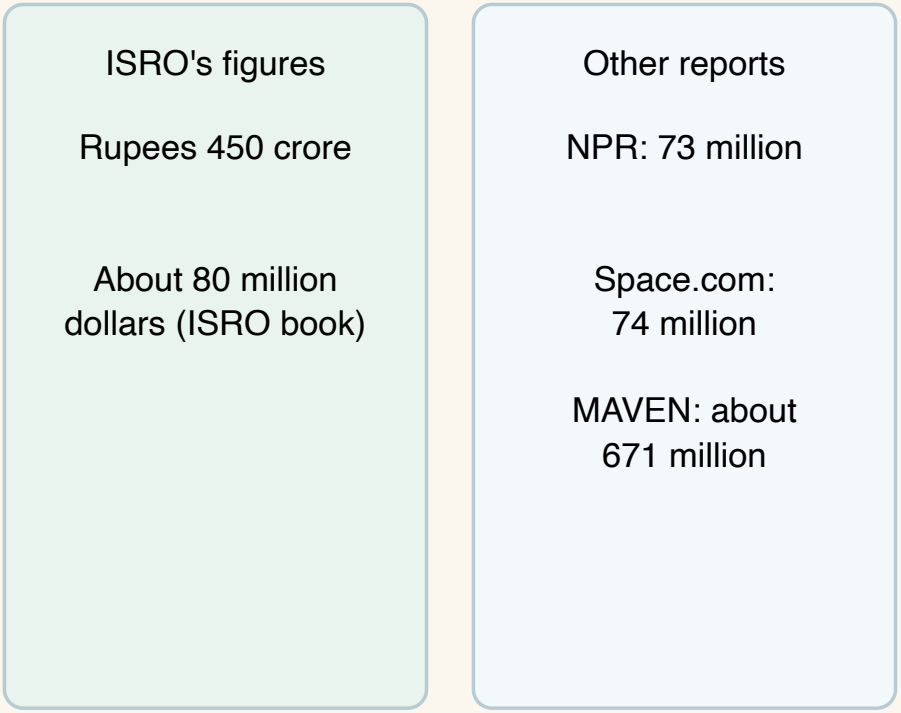
18. How much did the mission cost?

ISRO gives the cost as **Rupees 450 crore**. Its illustrated book says this is about 80 million US dollars. Outside reports used different dollar numbers.

- NPR (2013): a budget of 73 million dollars.
- Space.com: 74 million dollars.
- NASA's MAVEN: about 671 million dollars.

ISRO calls MOM the most economical interplanetary mission in the world. NPR gave several reasons for the low cost. Engineers in India cost less, and the instruments were fairly simple.

The dollar figure depends on the exchange rate and the source. For exams, the rupee figure is the safest. See Source disagreements.



Learn the rupee figure for exams. Original explanatory diagram.

Source: ISRO, Mars Orbiter Mission page (item 18)

Source: ISRO, Illustrated Book on the Mars Orbiter Mission (item 18)

Source: ISRO, Long Term Archive release statement (item 18)

Source: NPR, Why India's Mars Mission Is So Much Cheaper, 2013 (item 18)

Source: Space.com, India's second Mars mission (item 18)

What did the spacecraft carry, and what did it

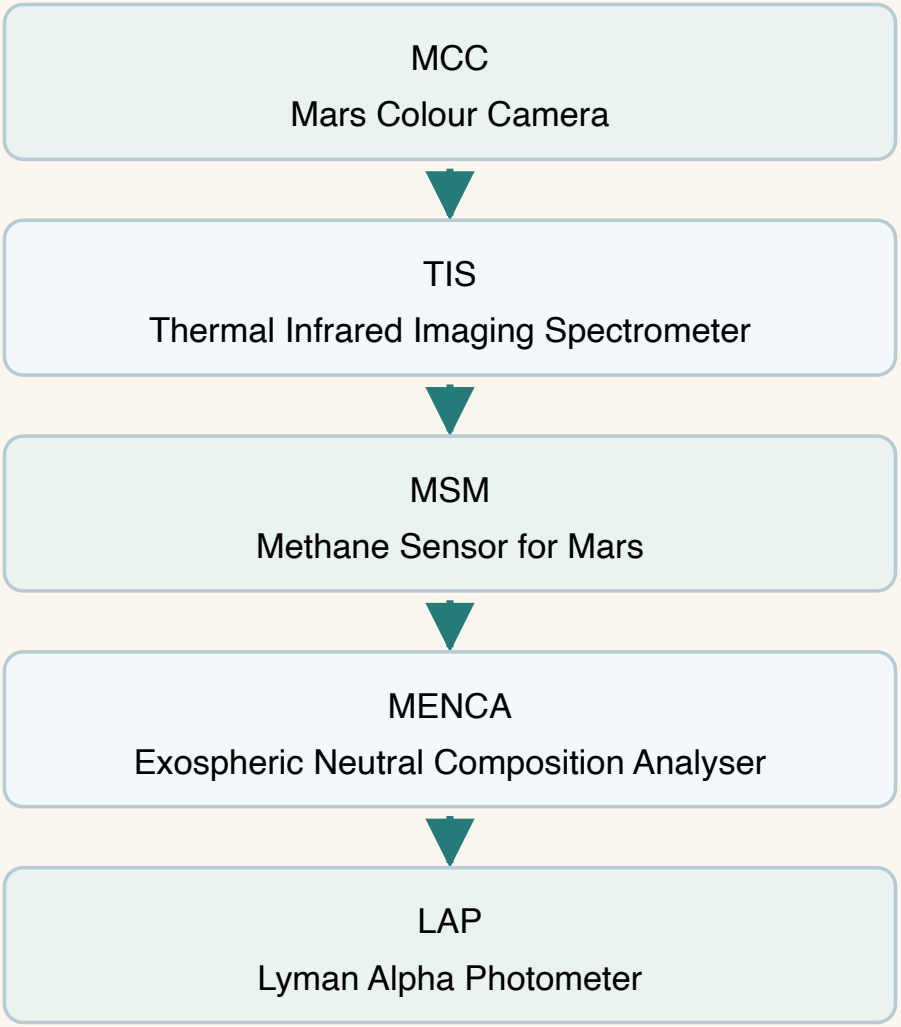
find?

19. What are the five payloads?

The spacecraft carried **five** scientific instruments. ISRO lists them by name and short form.

- Mars Colour Camera (MCC).
- Thermal Infrared Imaging Spectrometer (TIS).
- Methane Sensor for Mars (MSM).
- Mars Exospheric Neutral Composition Analyser (MENCA).
- Lyman Alpha Photometer (LAP).

Three were built at the Space Applications Centre, Ahmedabad. They are the camera, the methane sensor and the thermal imager. MENCA came from the Space Physics Laboratory at VSSC, Thiruvananthapuram. LAP came from LEOS, Bengaluru.



Three came from the Space Applications Centre. Original explanatory diagram.

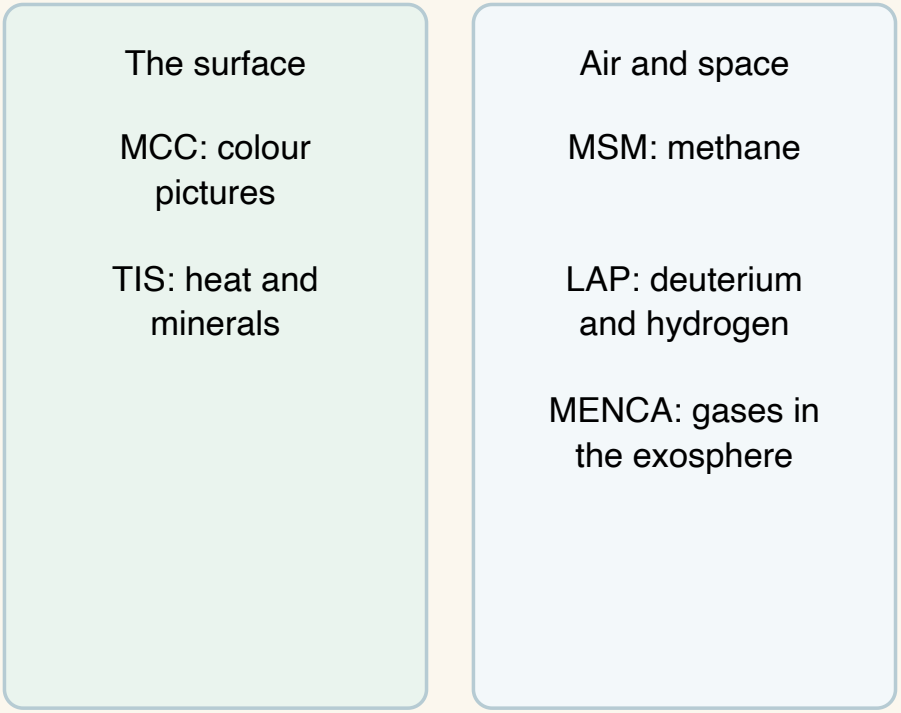
Source: ISRO, FAQ on the Mars Orbiter Mission (item 19)

Source: ISRO, Long Term Archive release statement (item 19)

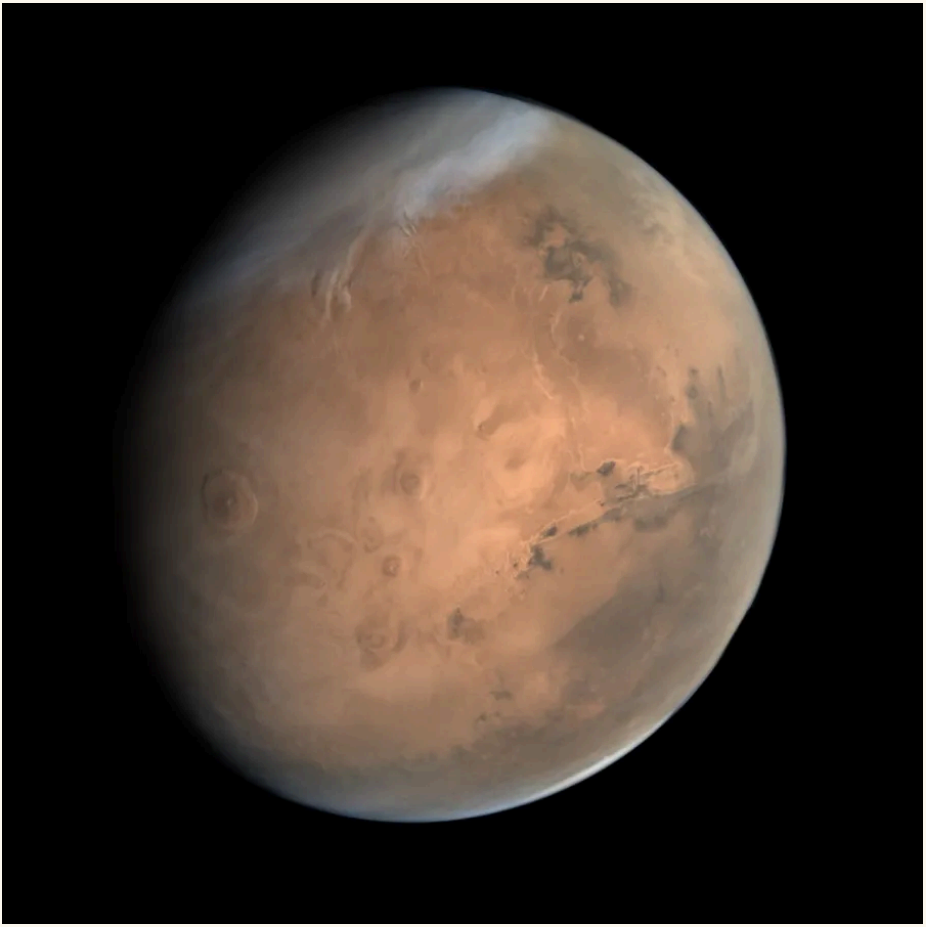
20. What was each payload meant to do?

Two instruments study the surface. Two study the atmosphere. One studies the particles near Mars.

- MCC: takes colour pictures to map landforms, dust storms and dust devils.
- TIS: measures heat from the surface in the 7 to 13 micron range. It maps temperature and minerals.
- MSM: looks for methane at the level of a few parts per billion. Methane can come from geology or from life.
- LAP: measures deuterium and hydrogen in the upper air. This shows how water was lost.
- MENCA: a mass spectrometer that studies neutral gases in the outer air, called the exosphere.



Methane could come from geology or from life. Original explanatory diagram.



True-colour view of Mars from the Mars Orbiter Mission, taken from 76,000 km, by ISRO / ISSDC / Justin Cowart (CC BY 2.0), Wikimedia Commons.

Source: ISRO, Mars Orbiter Mission page (item 20)

Source: ISRO, Overview of the Mars Orbiter Mission (item 20)

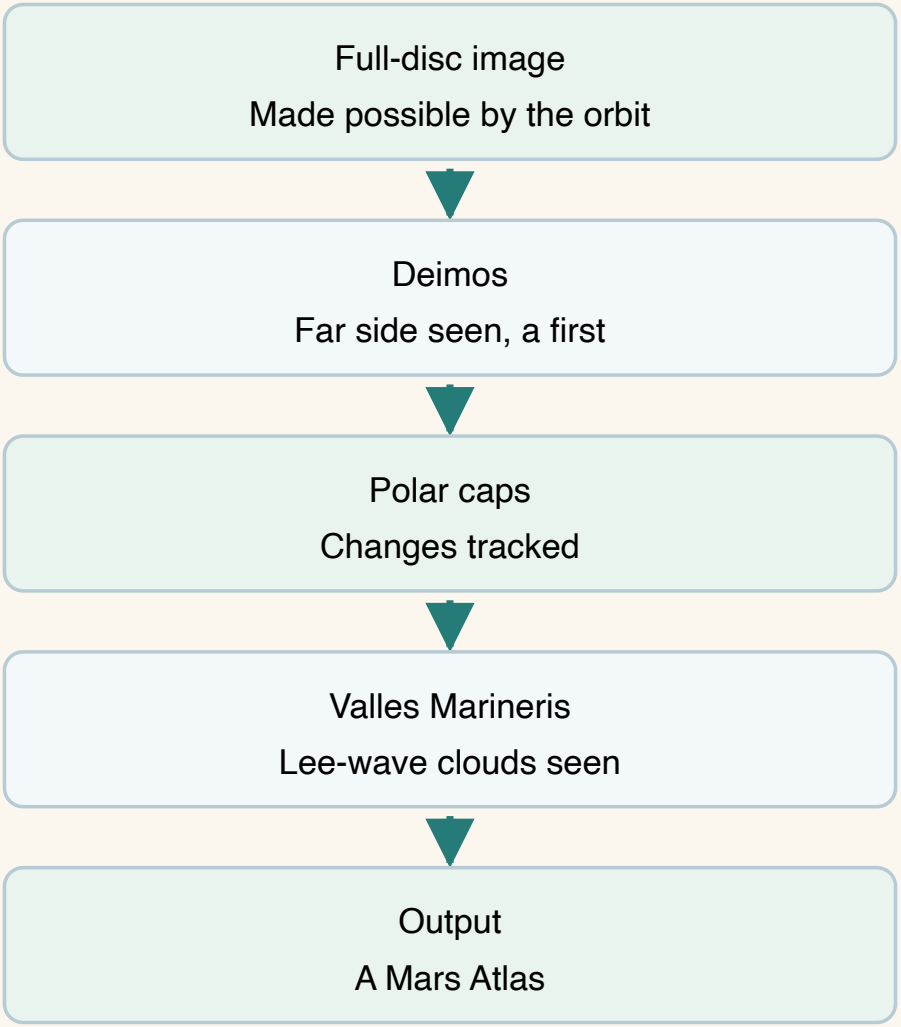
Source: Kiran Kumar and Chauhan, Current Science 2014 (item 20)

21. What did the camera and imaging payloads show?

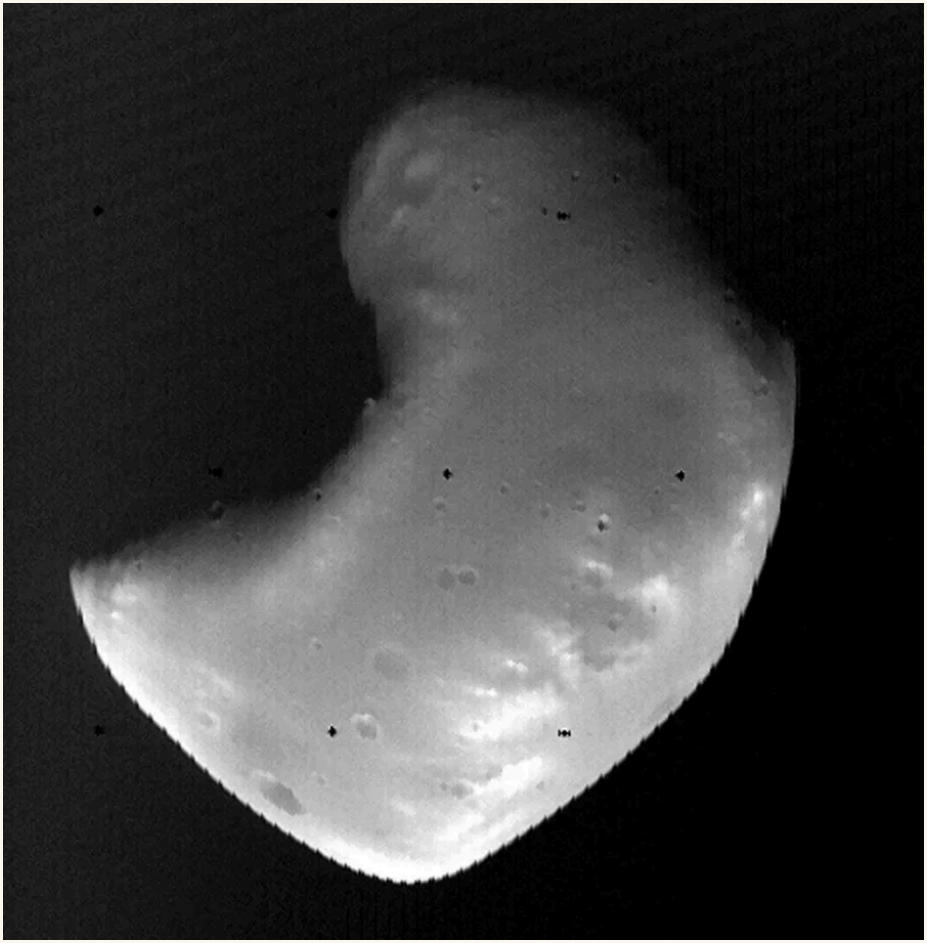
ISRO’s 2022 summary lists the results.

- The camera took a full-disc image of Mars. The oval orbit made this possible.
- It photographed the far side of Deimos, a moon of Mars, for the first time.
- It tracked changes in the polar ice caps.
- It showed lee-wave clouds above the southern wall of Valles Marineris.
- It helped study dust storms and the dust layer.

ISRO also published a Mars Atlas from the camera's images. A peer-reviewed paper in Planetary and Space Science describes the Deimos result as "a rarity among contemporary Mars orbiters".



A rarity among Mars orbiters, says one paper. Original explanatory diagram.



Deimos, a moon of Mars, imaged by the Viking 2 orbiter, NASA (public domain), via Wikimedia Commons.

Source: ISRO, update on the national meet, 2022 (item 21)

Source: ISRO, Mars Orbiter Mission page (item 21)

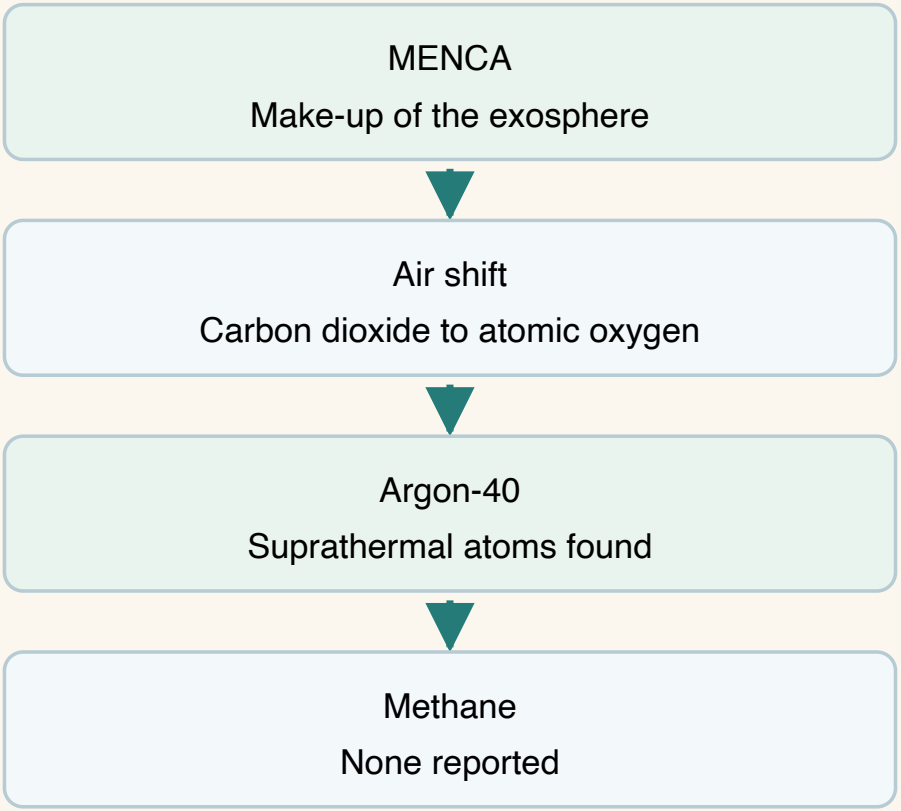
Source: ISRO, MOM list of publications (item 21)

22. What did the atmosphere instruments find?

The atmosphere results are more modest. ISRO’s 2022 summary lists these.

- MENCA measured the make-up of gases in the Mars exosphere.
- It found where the air shifts from carbon-dioxide rich to atomic-oxygen rich on the evening side.
- It found “suprathermal” argon-40 atoms. This hints at one way Mars lost its air.

The methane result was a disappointment. The Planetary Society reported in 2016 that the methane sensor had not found any methane. It added that the sensor may simply be too weak to sense small amounts. So the result is not proof that Mars has no methane.



The sensor may simply be too weak. Original explanatory diagram.

True or False: The methane sensor found methane on Mars.
Source: ISRO, update on the national meet, 2022 (item 22)

Source: Planetary Society, MOM's Second Anniversary at Mars, 2016 (item 22)

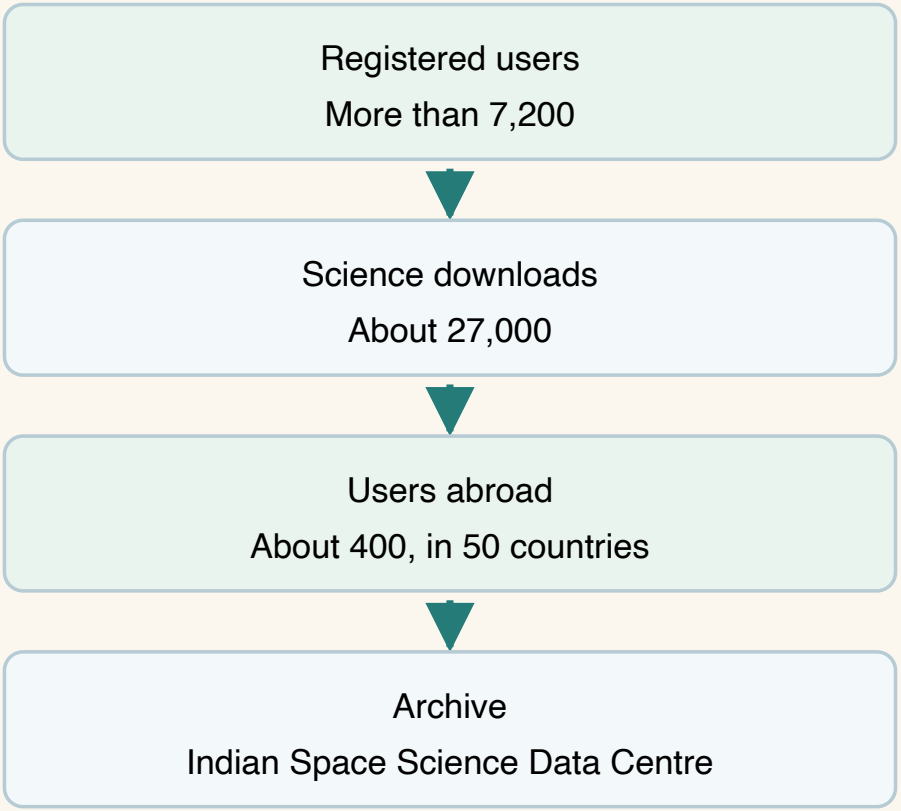
Source: ISRO, MOM list of publications (item 22)

23. How much data came out of the mission, and who used it?

ISRO releases the data through the Indian Space Science Data Centre. The 2022 meeting gave these numbers.

- More than 7,200 registered users.
- About 27,000 downloads of science data.
- About 400 users from 50 other countries.

The same release says the mission helped train researchers.



Users came from India and abroad. Original explanatory diagram.

Source: ISRO, update on the national meet, 2022 (item 23)

Source: ISRO, Mars Orbiter Mission page (item 23)

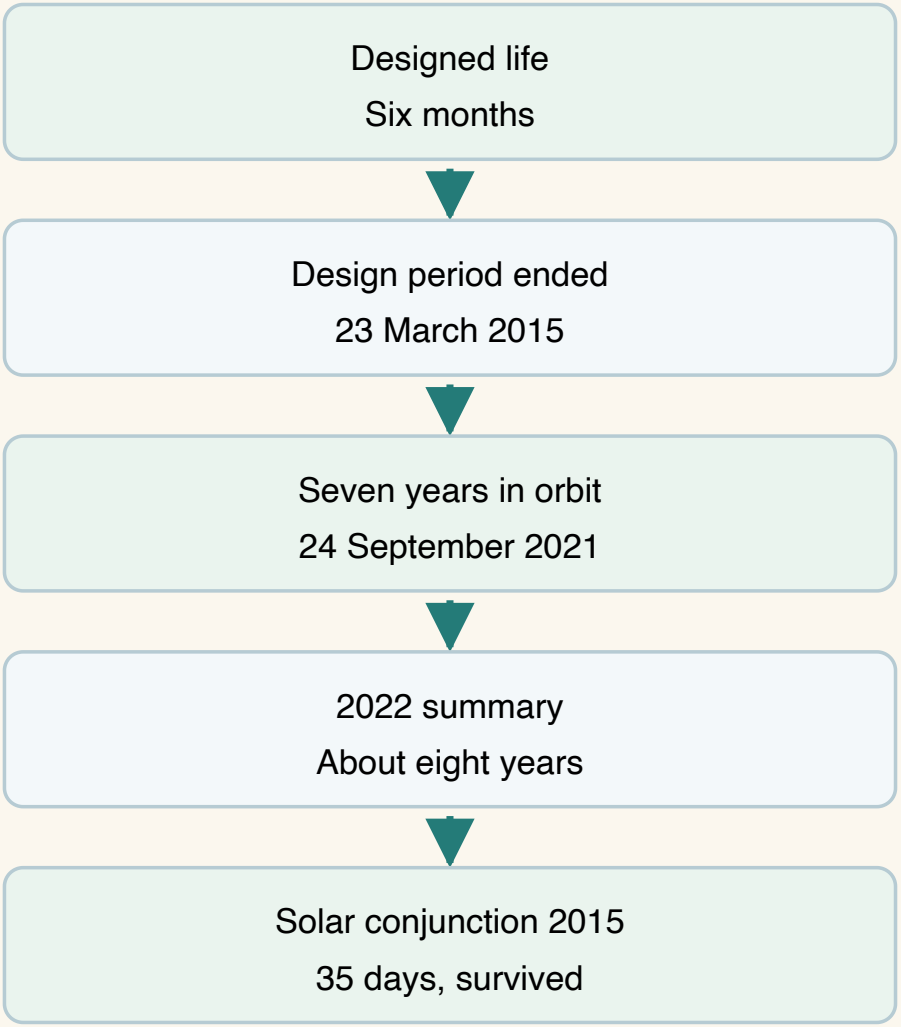
How long did it last, and how does it compare with other missions?

24. How long was the mission meant to last, and how long did it work?

ISRO says the designed life was **six months**. That period ended on 23 March 2015. The mission kept working long after that.

- It completed 7 years in orbit on 24 September 2021.
- ISRO's 2022 summary says it lived about eight years in Mars orbit.
- It survived a 35-day solar conjunction in 2015 on its own.

Space.com says ISRO designed it to last six to 10 months. ISRO's own pages say six months. Use the ISRO number.



Space.com gives six to ten months instead. Original explanatory diagram.

Source: ISRO, FAQ on the Mars Orbiter Mission (item 24)

Source: ISRO, Mars Orbiter Mission page (item 24)

Source: ISRO, update on the national meet, 2022 (item 24)

Source: ISRO, Long Term Archive release statement (item 24)

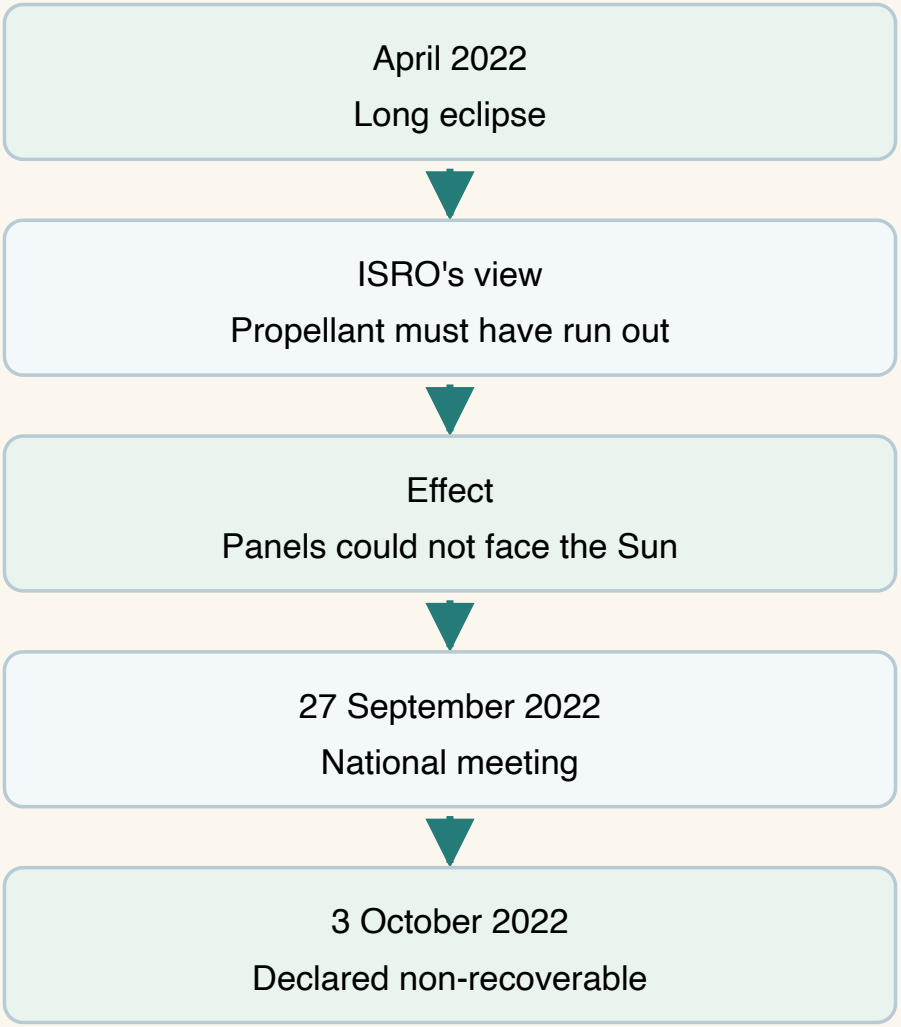
Source: Space.com, India's second Mars mission (item 24)

25. How and why did the mission end?

ISRO lost contact with the spacecraft after a long eclipse in **April 2022**. ISRO said the propellant must have run out.

Without fuel, the spacecraft could not point its panels at the Sun. That meant it could not make power for long. ISRO declared it non-recoverable and at its end-of-life.

ISRO announced this on 3 October 2022. The announcement followed a national meeting on 27 September 2022. ISRO called the mission a remarkable technological and scientific feat.



The cause is ISRO's inference, not a measured fact. Original explanatory diagram.

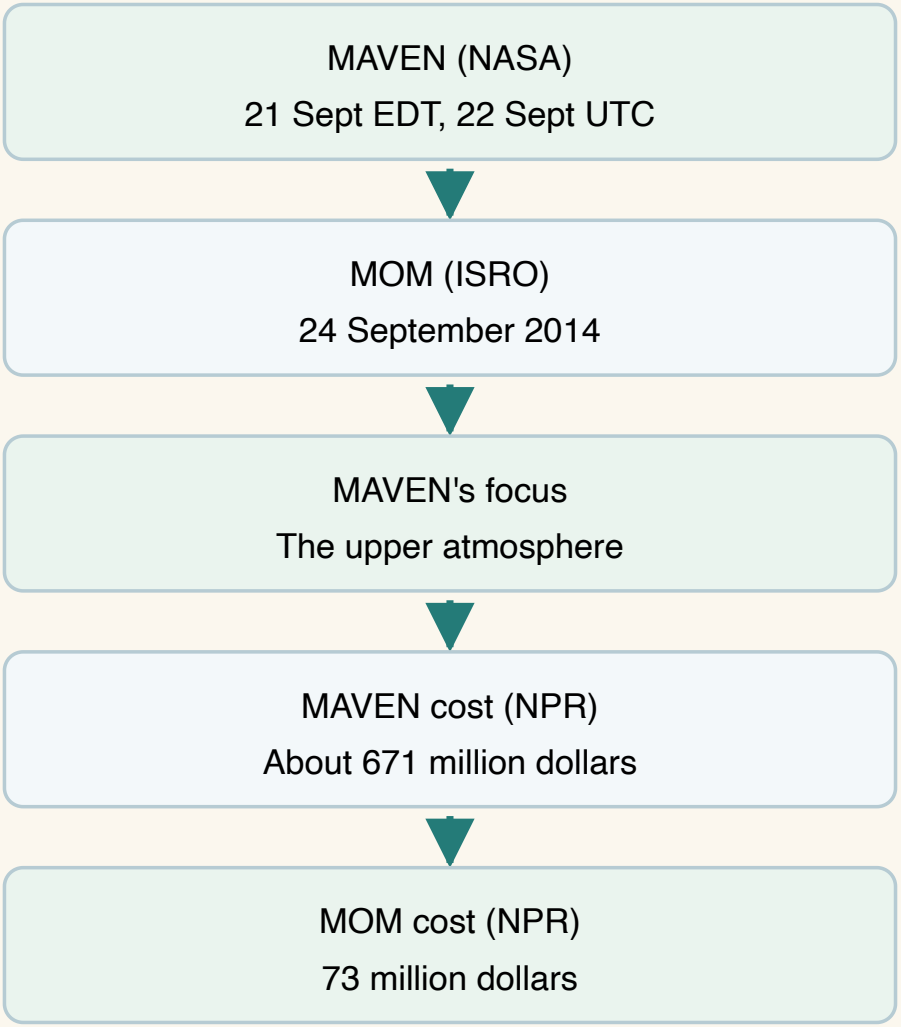
Source: ISRO, update on the national meet, 2022 (item 25)

26. How does it compare with other Mars missions?

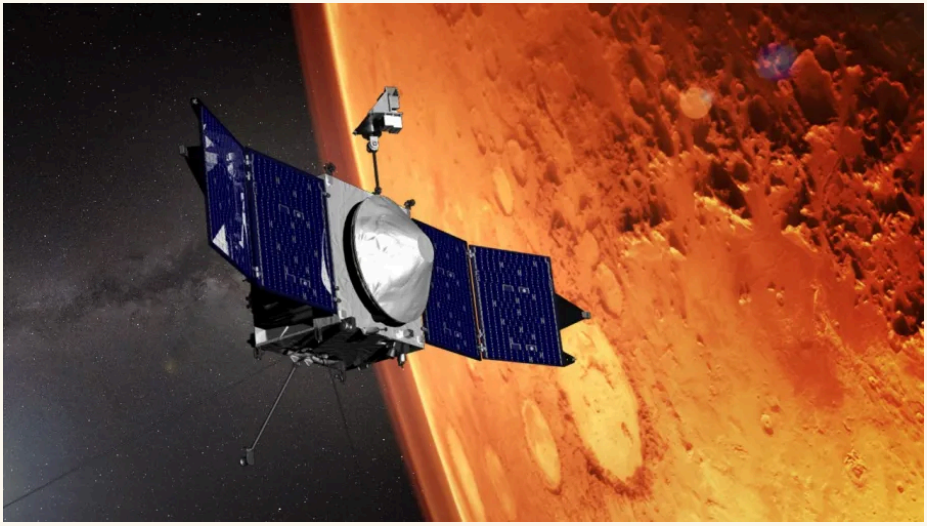
Only a few facts here are backed by the sources.

- Mariner 9 (NASA, 1971) was the first spacecraft to orbit another planet.
- Mars Express (ESA) entered orbit on 25 December 2003.
- NASA's MAVEN entered Mars orbit at 10:24 pm EDT on 21 September 2014. That is 22 September in UTC, about two days before MOM.
- MAVEN was the first spacecraft dedicated to the upper atmosphere of Mars.

MOM was a technology demonstration with five small instruments. NPR put MAVEN's cost at about 671 million dollars against India's 73 million.



Costs are NPR's 2013 figures. Original explanatory diagram.



Artist's illustration of the MAVEN spacecraft above the limb of Mars, NASA (public domain), via Wikimedia Commons.

Source: NASA, Mariner 9 (item 26)

Source: ESA, Mars Express overview (item 26)

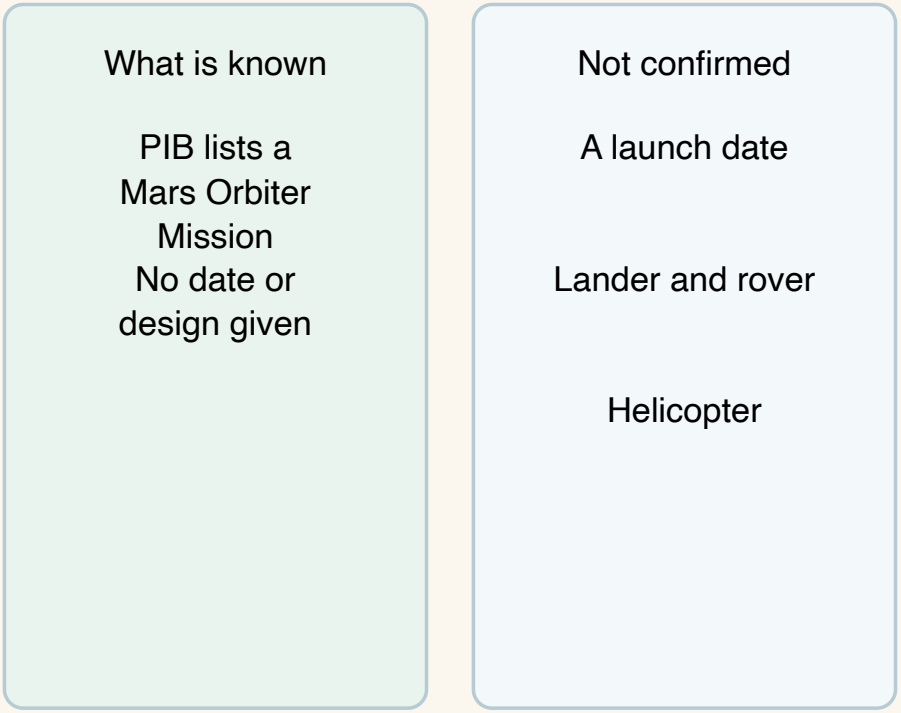
Source: NASA, MAVEN enters Mars orbit, 2014 (item 26)

Source: NPR, Why India's Mars Mission Is So Much Cheaper, 2013 (item 26)

27. Is there a Mangalyaan-2?

Plans have been reported, but ISRO has not confirmed the details. Space.com reported in 2024 that ISRO officials described a Mars Orbiter Mission-2. The reports mention a lander-type mission with a rover and a helicopter. Space.com itself says ISRO had made no official announcements.

PIB's 2026 explainer lists "Mars Orbiter Mission" among upcoming scientific missions. It gives no date or design. Treat Mangalyaan-2 as a planned mission, with no launch date to learn.



Treat it as a planned mission. Original explanatory diagram.

Source: Space.com, India's second Mars mission (item 27)

Source: PIB, India's Space Odyssey explainer (item 27)

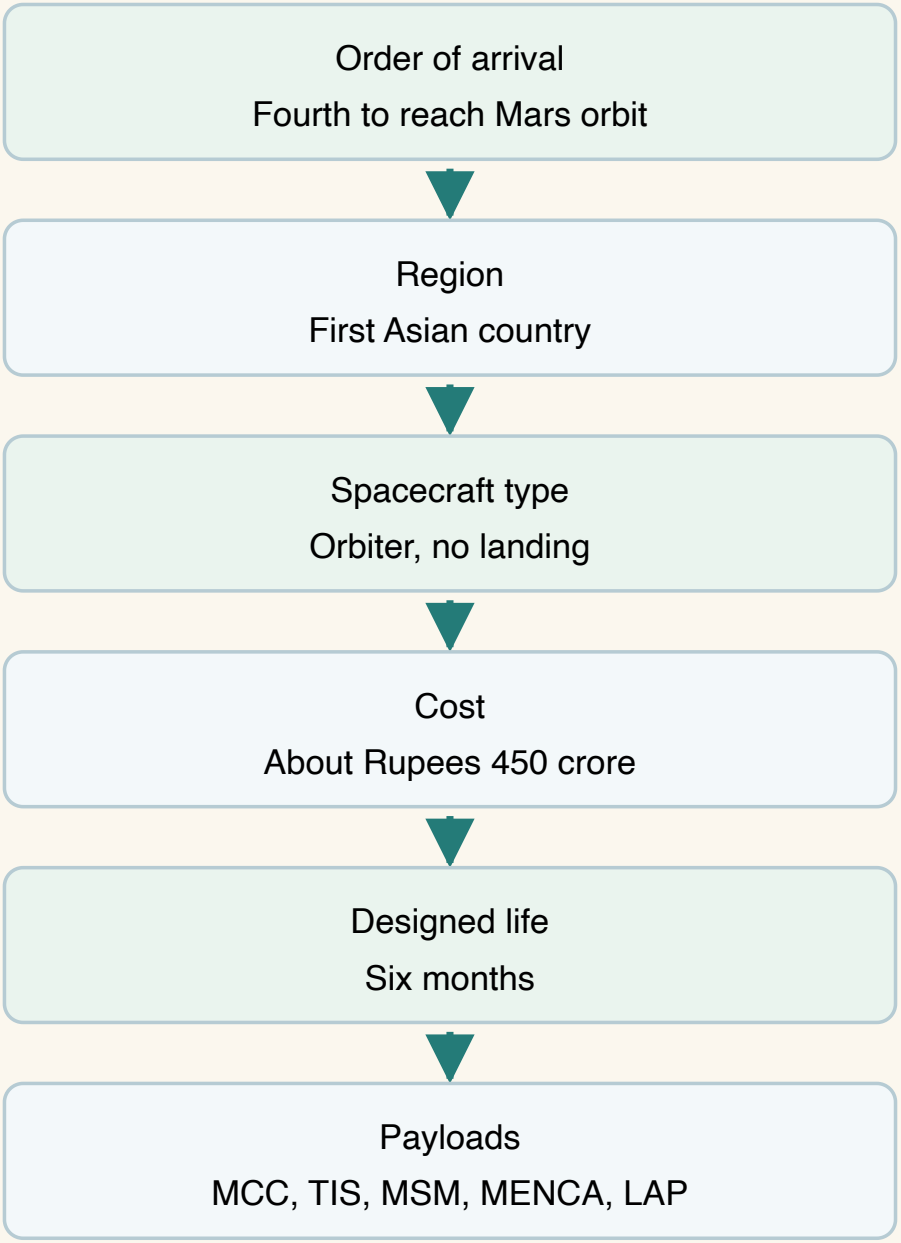
How do you answer exam questions on Mangalyaan?

28. What are the exam traps?

Use this checklist.

- Mangalyaan and the Mars Orbiter Mission are the same mission.

- India was the fourth space agency to reach Mars orbit. It was not the second.
- The three before India were NASA, the Soviet Union and ESA.
- India was the first Asian country to reach Mars orbit.
- It was an orbiter. It did not land.
- Launch: 5 November 2013, PSLV-C25 (PSLV-XL), Sriharikota.
- Mars Orbit Insertion: 24 September 2014.
- Cost: about Rupees 450 crore. Quote the rupee figure.
- Designed life: six months. ISRO says actual life was about eight years.
- Five payloads: MCC, TIS, MSM, LAP and MENCA.
- The methane sensor did not report a methane find.
- The “first attempt” claim is India’s own wording. Say “first Asian country, and on its first attempt”.



State the narrow wording, not the broad one. Original explanatory diagram.

Source: ISRO, Mars Orbiter Mission page (item 28)

Source: PIB, spacecraft inserted into Mars orbit, 2014 (item 28)

Source: ISRO, FAQ on the Mars Orbiter Mission (item 28)

Source: PIB, India's Space Odyssey explainer (item 28)

Source: Planetary Society, MOM's Second Anniversary at Mars, 2016 (item 28)

Four questions to think through

What made the engine restart such a gamble?

Ten months of idling is a long time for an engine. It had to start on the day. ISRO sealed it with pyro valves and copied the flight conditions in ground tests.

Is India really the only country to succeed on its first try?

ISRO's illustrated book says so. ESA's Mars Express, however, was Europe's first Mars mission, and it reached orbit in 2003. Its lander was lost. So the wording "first Asian country, on its first attempt" is safer.

Why do dollar costs for the mission differ?

ISRO gives Rupees 450 crore. Dollar figures depend on the exchange rate and the outside source. NPR said 73 million and Space.com said 74 million. So quote the rupee figure.

How did a six-month mission work for years?

ISRO planned for six months of life. The spacecraft kept working long after that. It even survived a 35-day solar conjunction in 2015 on its own. ISRO's 2022 summary says about eight years.

Check your understanding

Your 7 quick checks Answered 0 of · Correct
This score resets when the page reloads.

Continue to the 8 MCQs

✅ Test Yourself

Try 8 practice questions on Mangalyaan.

Practice MCQs

1. Regarding the Mangalyaan mission launched by ISRO, which combination is correct: is it also called the Mars Orbiter Mission, did it make India the second country to orbit Mars after the USA, and did it make India the only country to succeed on its very first Mars attempt?

A. All three statements together

B. Only the naming statement alone

C. Only the naming and first-attempt-success statements are genuinely correct

D. Only the second-country statement alone

See answer ↓

2. According to ISRO, what was the primary objective of the Mars Orbiter Mission?

A. To demonstrate technology for an interplanetary mission

B. To land a rover on the Martian surface

C. To find liquid water under the Martian surface

D. To bring Mars soil samples back to Earth

See answer ↓

3. Which rocket launched the Mars Orbiter Mission spacecraft, and from where?

A. PSLV-C25 (PSLV-XL) from Sriharikota

B. PSLV-C25 from Thumba

C. LVM3 from Sriharikota

D. GSLV Mk II from Sriharikota

See answer ↓

4. Why did the Mars Orbiter Mission spacecraft take about 300 days to reach Mars?

A. The PSLV could give the spacecraft only half the speed it needed

B. It circled Earth for ten months before it started the journey

C. ISRO chose the least-fuel path, which suits only certain Earth-Mars alignments

D. It stopped near the Moon to refuel before moving on

See answer ↓

5. On which date did the Mars Orbiter Mission spacecraft enter orbit around Mars?

A. 1 December 2014

B. 25 September 2014

C. 24 September 2014

D. 5 November 2013

See answer ↓

6. Which place in the order of space agencies did ISRO take when it put a spacecraft into Mars orbit, according to PIB?

A. Second

B. Third

C. First

D. Fourth

See answer ↓

7. What did ISRO give as the cost of the Mars Orbiter Mission?

A. About Rupees 4,500 crore

B. About Rupees 45 crore

C. About Rupees 1,450 crore

D. About Rupees 450 crore

See answer ↓

8. Which Mars Orbiter Mission payload was built to look for methane, and what did it report?

A. The Lyman Alpha Photometer; it found methane near the poles

B. The Methane Sensor for Mars; it reported no methane find

C. MENCA; it confirmed life on Mars

D. The Mars Colour Camera; it found methane in the dust

See answer ↓

Answer Key

1. **C.** The naming statement is correct, since Mangalyaan is the Mars Orbiter Mission. PIB called ISRO the fourth space agency to reach Mars orbit. So the second-country statement is wrong. ISRO says India succeeded on its first attempt, and the key follows ISRO. ISRO's book also says India is the only country to do so. That word is ISRO's wording, not a settled fact. ↑ Q1
2. **A.** ISRO describes the objectives as primarily technological. The aim was to design, build and fly a spacecraft that could reach Mars orbit. Science came second. It used Indian instruments to study surface features, minerals and the atmosphere. The spacecraft did not land. ↑ Q2
3. **A.** PSLV-C25 lifted off on 5 November 2013 from the First Launch Pad at Sriharikota. It was the extended PSLV-XL version, with six strap-on boosters. The rocket only placed the spacecraft in an oval Earth orbit. The spacecraft's own engine then did the rest. ↑ Q3
4. **C.** ISRO chose a Hohmann transfer, also called a minimum energy transfer orbit. It is roughly half an ellipse round the Sun. It works only when Earth, the Sun and Mars line up in a certain way. That match returns about every 780 days. The other options are not in any source opened for this lesson. ↑ Q4
5. **C.** PIB's press release on the day gives 24 September 2014. The insertion burn began at 07:17:32 IST. It lasted about 23 minutes. NASA's MAVEN had entered Mars orbit about two days earlier, on 22 September in UTC. The launch date was 5 November 2013. ↑ Q5
6. **D.** PIB said that ISRO became the fourth space agency to send a spacecraft to Mars orbit. Three agencies had reached it before. NASA's Mariner 9 was the first spacecraft to orbit another planet, in November 1971. ESA's Mars Express followed on 25 December 2003. India was also the first Asian country to reach Mars orbit. ↑ Q6
7. **D.** ISRO gives the cost as Rupees 450 crore. Its illustrated book says this is about 80 million US dollars. Outside reports gave other dollar figures, such as 73 million from NPR. So the dollar number changes with the source. The rupee figure is the safest to quote. ↑ Q7

8. **B.** The Methane Sensor for Mars, or MSM, was meant to look for methane at a few parts per billion. The Planetary Society reported in 2016 that it had not found any methane. The sensor may be too weak to sense small amounts. So the result does not prove that Mars has no methane. ↑ Q8

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