

Manned Space Mission - Russian Rocket Launch Failure

What is the issue?

\n\n

\n

- A Russian rocket launch recently failed but both astronauts on board survived the failure.

\n

- With it's preparations for a manned space mission, India must look into the measures on astronaut safety.

\n

\n\n

What happened?

\n\n

\n

- The Russian rocket Soyuz FG was on an expedition to the International Space Station.

\n

- The failure of the rocket led to the abortion of this Expedition.

\n

- On board the Soyuz MS 10 mission were Alexey Ovchinin of Roscosmos and Nick Hague of NASA.

\n

- The failure was detected at an altitude of 50 km.

\n

- So an emergency operation was carried out to separate the crew module.

\n

- The astronauts landed on Earth some 402 km from the launch site at the Russian Baikonur cosmodrome.

\n

- It was the first mid-flight failure of a Soyuz rocket since 1975.

\n

- In 1975, a mission was aborted after the second stage failed to fire while it was climbing to leave Earth's atmosphere, with crew on board.

\n

\n\n

What is the significance?

\n\n

- \n
- The first successful human space flight in 1961 was by Yuri Gagarin.
- \n
- Since then, 18 astronauts (13 Americans, 4 Russians, 1 Israeli) have lost their lives on space missions.
- \n
- The rocket, the crew module and all systems involved require a “human ratings certification” before they can be used to send a human into space.
- \n
- The failure of Russian rocket launch has come as a reminder of the perils and technological challenges involved in every space flight.
- \n
- The survival of the astronauts on board has been hailed as an example that underlines the safety measures that were in place.

\n\n

- \n
- **India** - The ISRO is preparing to become the 4th country to launch a human into space (after Russia, the US and China).
- \n
- In this line, ISRO's Gaganyaan mission is given the 2022 deadline.
- \n
- The focus is now moving from a mission-critical nature to a safety-critical launch nature of rockets.

\n\n

What are the NASA safety guidelines?

\n\n

- \n
- A NASA manual on human ratings of space systems is available in the public domain.
- \n
- It underlines the difference between the development of systems for human space flights and missions with robotic payloads.
- \n
- A human-rated system -
- \n

\n\n

\n

i. accommodates human needs

\n

ii. effectively utilizes human capabilities

\n

iii. controls hazards and manages safety risk associated with human spaceflight

\n

iv. provides, to the maximum extent practical, the capability to safely recover the crew from hazardous situations

\n

\n\n

\n

- While designing a rocket to launch any mechanical payload, scientists do not have to consider factors like -

\n

\n\n

\n

i. the amount of heat generated

\n

ii. vibration caused

\n

iii. metallic changes in the payload capsule

\n

\n\n

\n

- But for rockets meant to carry humans, all these factors will have to be brought within human tolerance levels.

\n

- The rocket has to be designed to 25% above the worst case of the expected load in the case of a satellite launcher.

\n

- For a human-rated launcher, it has to be designed 40% above the worst-case loads.

\n

- This is difficult and challenging to do without making the rocket really heavy.

\n

\n\n

INDIA'S TRYST WITH ITS MAN IN SPACE

April 2, 1984: Rakesh Sharma becomes the first and only Indian citizen to travel in space

2007 - First proposals for ISRO's manned space mission

2008 - India and Russia sign MoU for manned space mission; plan abandoned in 2010

Dec 2014 - Experimental flight of the manned mission launcher - GSLV Mk-III - tested



2016 - Then director of Vikram Sarabhai Space Centre, K Sivan announced 'Pad abort' test for the mission capsule

2017 - Initial estimates of the successful manned space mission

July 2018 - Pad abort test conducted successfully in Sriharikota

2022 - PM Narendra Modi's new target for manned space mission

\n\n

How is GSLV in this regard?

\n\n

\n

- ISRO's GSLV Mk III has undergone one experimental and one developmental flight.

\n

- It is expected to make 10 flights, including two in the form of an unmanned human space launch vehicle.

\n

- It is set to finally launch humans in 2022.

\n

- The GSLV Mk III was designed in the 2000-2002 time-frame, to ultimately become a vehicle that takes a human to space.

\n

- So it was designed keeping in mind human flight in the future and may not need any major tweaking.

\n

- The design conditions were kept in such a way that acceleration, reliability, safety, vibration and other aspects are all addressed right at the design stage.

\n

- But, instrumentation and processing required to abort a mission without causing damage to the crew are being looked into.

\n

\n\n

What should India do?

\n\n

\n

- India needs to build safety critical features into rockets.

\n

- The crew escape system is crucial to the human space mission.

\n

- The principle here is that there can be a less reliable rocket but a highly reliable crew escape system.

\n

- The most important part of a human space flight is the ability to detect an imminent danger and take action to abort the mission.

\n

- India needs to have systems for this and onboard intelligence required, to see what is happening around and take action if anomalies develop.

\n

\n\n

\n\n

Source: Indian Express

\n

