With MOM, 'safe mode' spells danger

One Of The Most Unpredictable Events In Spacecraft Navigation: Expert

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Chennai: After 300 days and 650 million km, as India's Mars Orbiter Mission (MOM) spacecraft gets into the last lap to the red planet, a term the scientists have begun to hate hearing is, ironically, 'safe mode.'

A spacecraft goes into safe mode when it encounters a strong cosmic current or a flare. When this happens, the spacecraft positions itself to keep its antenna looking at Earth for signals and solar panels at sun for energy, and shuts down all 'non-essential' systems. This is not unusual — on September 11, Nasa spacecraft Dawn went into

safe mode and was soon revived.

But if it happens to MOM during the last leg of its journey, scientists would have very little time to 'wake up' the craft and get it into the Mars orbit. Failing to reactivate the spacecraft to normal mode would mean MOM flying past Mars to outer space.

"Safe mode is one of the most unpredictable events in spacecraft navigation," says T K Alex, former director of Isro's Satellite Centre. "You never know when an electric streak can strike in deep space." All modern spacecraft are designed to go into safe mode to protect itself from further damage. Once the danger is over, mission control on earth gives commands to reactivate the spacecraft. Nasa's Dawn, which is on its way to orbit the dwarf planet Ceres, was thus reactivated twice in the past three years.

MOM project director S Arunan is confident and cautious when he says that so far the Indian spacecraft has not gone into safe mode.

"Getting MOM out of safe mode is no big deal," says Arunan. "But if it happens during the last day, we will be hard-pressed for time."

This is because scientists have already uplinked all commands for the final manoeuvre for MOM to get into the Martian orbit on September 24. A safe mode event would mean these commands not being carried out. And scientist will have to recheck the commands and, if needed, uplink them afresh. All these have to be done before the spacecraft reaches the orbital vicinity of Mars. Adding to the challenge will be the 12-minute one-way time lag for radio signals between Earth and MOM.

Getting anywhere between 200km and 11,000km will keep the spacecraft in the Martian orbit, but scientists are planning to get as close as 365km to Mars in an elliptical orbit with the farthest point at 80,000km. Going by MOM's present trajectory, it is expected to get into the orbit at around 510km.