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MAD ABOUT MOVIES TABLOID PAGE 6,7

THE VIEWS | P7

Arabs recommit to two-state solution

US likely to take serious steps to launch a new initiative

TABLOID | P4-5 & NATION | P4

Valentine's Day in Dubai

From beachside dinners to candle-lit experiences, here's what you can do

NATION/YOUR MONEY | P5

Bitcoin is soaring, but for how long?

An analysis of price trends and what steps investors should take

EMIRATES MARS MISSION

A journey of Hope that's out of this world

With one giant leap for Arab science, UAE's Hope Probe proves "that the impossible is possible"

BY CHIRANJIB SENGUPTA
Senior Assistant Editor

On November 14, 1971, Nasa's Mariner 9 became the first spacecraft to orbit Mars – narrowly beating the Soviet Mars 2 to the Red Planet at the height of the Cold War space race.

It was the first time in human history that a spacecraft orbited another planet, and just weeks later, Soviet space probes Mars 2 and Mars 3 arrived on Mars – making 1971 a milestone year in Mars exploration history.

It was also the year that the UAE was born in – with the founding leadership of the UAE signing the treaty that formally established the country at Dubai's Union House five days after Soviet-made Mars 3 landed on Mars.

For a nation that is only celebrating its Golden Jubilee this year, the successful entry of the Hope Probe into Martian orbit on Tuesday thus marks an extraordinary arc of human achievement for the UAE and the Arab world – making the first successful Arab interplanetary mission a scientific leap that recalls the Islamic Golden Age of astronomy, mathematics and medicine. It also makes the UAE only the fifth spacefaring entity to reach Mars after the US, the Soviet Union, Europe and India, and the second to reach the Red Planet in its maiden attempt.

Historic breakthrough

A trip to Mars has always been a risky venture with only a 50 per cent chance of success – it took the US and the then USSR several failed attempts before the eventual success of their missions. But for the UAE, the success comes a mere seven years after the launch of the Emirates Mars Mission in July 2014 – and seven months after the Hope Probe lifted off on a 174-foot rocket for a 493-million-km journey to Mars from Japan's Tanegashima.

That historic breakthrough, as President His Highness Shaikh Khalifa Bin Zayed Al Nahyan said in comments celebrating the achievement, "would not have been possible without the persistence and determination to implement the idea that emerged at the end of 2013" by His Highness Shaikh Mohammad Bin Rashid Al Maktoum, Vice-President and Prime Minister of UAE and Ruler of Dubai, who followed it up closely until its success.

Emirati talent pool

Pivoting on an extraordinary talent pool of Emirati scientists and engineers and developing a Mars science programme from scratch, the team behind the Hope Probe boasts an average age of 27, with more than 80 per cent of members in the Hope Science team being women.

When Omran Sharaf, project manager of the Emirates Mars Mission, calmly announced the successful completion of 27 nerve-wracking minutes of the Mars Orbit Insertion (MOI) by the probe on Tuesday night at the Mohammad Bin Rashid Space Centre (MBRSC), it was thus the culmination of an intense and breathtaking feat of science that truly embodies the UAE's motto: the impossible is possible.

Flying higher than previous Martian satellites, the Hope Probe will soon begin collecting a mixture of data and images and provide unique insights into the planet's atmosphere and climate patterns. The probe carries three instruments that will observe how neutral atoms of hydrogen and oxygen – remnants from once abundant water on Mars – leak into space and make the planet uninhabitable. In the process, Hope will not only return spectacular full-disk images of the planet, but also offer vital clues for the UAE's lofty ambition of setting up the first inhabitable human settlement on Mars by 2117. "It's an endeavour in developing capabilities and talent in the country," said Sara Al Amiri, UAE Minister of State for Advanced Technology and Chairperson of the UAE Space Agency. "And I truly hope this mission will impact an entire generation to strive to do things that are even bigger," she told news agencies.

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Rapid strides in space science

For Al Amiri – who began her career at the Emirates Institution for Advanced Science and Technology and worked on DubaiSat-1 and DubaiSat-2, and Sharaf – who lived in South Korea for 7 years to work on the command and data handling subsystem of DubaiSat-1, the UAE's rapid strides in space science represent its relentless quest to build a sustainable knowledge-based economy driven by advanced technologies.

That pursuit is evident from the young cadre of Emirati engineers, scientists, data analysts and programmers – all under the age of 35 – at the heart of the Hope Probe team. From Aisha Sharafi, a senior propulsion engineer who led the development of the probe's propulsion system, and Mariam Yousuf, the probe's Science data analyst in charge of studying the diurnal Martian data, to Hessa Al Matroushi, the Science deputy project manager with a pioneering body of work on models to simulate Mars thermospheric oxygen emissions; Ali Juma Al Suwaidi, FlatSat engineer responsible for anomaly tracking; Omar Abdul Rahman Hussain, the lead mission design and navigation engineer leading the probe's Monte Carlo Simulation, a highly precise quantitative risk analyses, and countless other Emirati talents, the Emirates Mars Mission represents the same kind of disruptive change that Dubai and the UAE have set global benchmarks for.

Biggest of several milestones

Hope is also the latest and biggest of several milestones within the UAE's space programme. In 2018, Hazza Al Mansouri became the first Emirati to go to space – spending around a week on the International Space Station; the UAE's national astronaut programme was created in 2017; the first Earth-observation satellite built entirely by Emirati engineers was launched in 2018 and a programme for Arab Space Pioneers in 2020. This scientific metamorphosis has been made possible thanks to the UAE's unique approach to international collaboration and knowledge transfer – for the Hope Probe, for example, the UAE Space Agency turned to the Laboratory for Atmospheric and Space Physics (LASP) at the University of Colorado Boulder, which has a long history of building spacecraft, as well as to Arizona State University, the University of California, Berkeley and the University College London.

Of course, there were challenges along the way for the Hope Probe – the biggest being the coronavirus pandemic, which shut down airports and slowed global industries to a crawl. But instead of pushing back on deadlines, the Mars Mission team actually accelerated the programme, sending advance teams to the launch site in Japan with enough lead time to spend two weeks in quarantine. The spacecraft was sent from Dubai after final tests to Nagoya airport in Japan, and finally arrived by barge at the Tanegashima Space Centre.

The result of that incredible hard work and global collaboration will not only help the UAE transform its science and technology sector, but also benefit the global science community by offering new insights and data about Mars. As His Highness Shaikh Mohammad Bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces, observed: "The probe's arrival to the Red Planet celebrates our journey of 50 years in the best image that fits the UAE and captures its true story to the world."

New era of Arab leadership

Just as the Shammasiyya and Jabal Qasiyun astronomical observatories of the 9th century set the stage for sophisticated advances in mathematics, and the works of Arab pioneers such as Ibn Al Haytham (the Father of Optics), Nasiruddin Al Tusi, Egypt's Ibn Younus and Syria's Mariam Al Asturlabi inspired centuries of thinkers and scientists during the Islamic Golden Age, the Hope Probe heralds a new era of Arab leadership in science and technology.

"Today is the start of a new chapter in Arab history... of trust in our capability to compete with other nations and people," Shaikh Mohammad Bin Rashid tweeted shortly after the Hope Probe entered Mars orbit. "The UAE will celebrate its Golden Jubilee with science, culture and inspiration because we aim to build a model of development."

With one giant leap for Arab science, the Hope Probe has proven that the impossible is possible.