

Mohammed bin Rashid Space Centre Magazine

Majarat

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Inspired by Space Science and Technology



Sheikh Hamdan:
“The future is to be
turned into reality today”

MBRSC to build new
environmental Nanosatellite

Work begins on Engineering
model of Hope Probe

OMRAN SHARAF – “THE HOPE PROBE IS ON TARGET AND ON SCHEDULE”

As 2017 begins, we move another step nearer the launch date of the Emirates Mars Mission - Hope Probe. The forthcoming 12 months will be a particularly crucial period for the development of the Hope Probe, as this is the year the planning and the designs become reality, and the development and testing stages begin. Majarat caught up with Omran Sharaf, Project Manager of the Emirates Mars Mission, to find out what this year has in store, to see how the mission is progressing, and to look at the impact it's already had on galvanising the youth of the UAE and the region.



Walking into the Emirates Mars Mission offices at MBRSC, what's immediately striking is the positivity and interaction between the teams. There's a noticeably vibrant atmosphere precipitated by the open plan environment, much, we suggest, like the Google offices – but without the slide. “We'll look in to getting the slide...” Omran Sharaf tells us as we sit down to talk all things Hope Probe.

We're now two years on since the initial project R&D began for a UAE mission to Mars. Once the announcement was given by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Prime Minister and Vice President of the UAE and Ruler of Dubai, the focus and the pressure was immediately ramped up on Omran and MBRSC, but they seem in good spirits and they seem very focused – two important

factors in meeting the demanding targets of the mission. Let's not forget that nothing like this has ever been attempted, much less achieved, by the UAE or any Arab country, not that this seems to phase Omran.

“We're on target and on schedule. We've met all the major milestones that we announced earlier during the project,” Omran tells us.

“These milestones are linked to certain major activities or accomplishments that take place within the project. We are on track with that. We’ve now completed the designs, as was announced by His Highness Sheik Mohammed at the end of last year, and this year we are going to now start to manufacture and work on the engineering model of the spacecraft.”

Undoubtedly the most notable milestone for the mission so far was the visit of Sheikh Mohammed. This was a huge moment for the team working on the probe, as it gave them the opportunity to show the country’s leaders exactly how far they’ve come since being set the challenge of taking the UAE to Mars.

“Sheikh Mohammed told us he’s so proud of the team, he’s happy with the progress, but he also mentioned on several occasions that what’s really important for him is the know-how. That we get the know-how, the knowledge that the UAE needs, and he reminded us that this mission is not just about reaching Mars, it’s beyond that. It’s about preparing the future scientists of the UAE who will be contributing to and building the post-oil economy that we are moving into. We call it a knowledge-based economy, but it’s not just knowledge, it’s an economy that I would call a creative, innovative, knowledge-based economy, and that’s the direction we’re moving in. A project like the Emirates Mars Mission, it’s more like a catalyst and a means to reach that bigger objective.”

2017 will see that bigger objective move a step nearer, as the project heads into a new phase – manufacturing parts and testing to ensure the approved design and each component works as it should.

“To test and verify our design we need to develop models similar to what we are going

to be launching, for certain parts. We’re going to be testing those and verifying those. That’s going to be the focus of the year, so it will be very busy for us. For the past two years we’ve been talking about the mission, and there’s been a lot of design work on paper and on computers – schematics and so on – but this is the phase now where we start to see the physical component of the spacecraft coming together.”

Before the final flight model can be built, the team must first manufacture an engineering model, essentially a replica of the one that will go to Mars. This will include many of the instruments and systems that have been introduced which are unique to the Hope Probe, designed specifically to meet the scientific objectives of the mission.

“Even though the parts we work on this year will mainly make up the engineering model, rather than the final flight model, it’s still a really important first step for us. That’s the plan for 2017. Developing the engineering

models, testing them all individually and then grouping them together and verifying the design.

“At the end of the phase of testing we will review the designs again, see what modifications we need to do, what are the things that performed well, what we might have to review and revise; and once that’s done we will start either redesigning or manufacturing the flight model, depending on how the testing goes.”

Omran tells us that if the testing goes well, the approved design of the Hope Probe will be frozen by the end of 2017. This means that there will be no amendments, and that the final flight model manufacture can begin. He expects this to happen early in 2018, with the entire process (which includes testing and integration as they go) to last two years, right up until the launch of the probe. But there are elements of the flight model that will be manufactured during 2017, he tells us.

“Certain parts, for example ones that have a heritage, ones that have been used and proven successful in previous Mars missions, we know they work. We’re not starting something from scratch, we’re learning from where others have ended, so certain designs that have that proven track record of success, we’re most probably not going to include on the engineering model, but the instruments that have been designed or modified by us to suit our own mission, they are the ones that we will really focus our testing on. It’s case by case. You can have an instrument, but within the instrument there are certain sub-systems so you pick and choose which sub-system you want to build an engineering model of, and which ones you’re already happy with and confident that they’re going to work. This saves time and it saves costs, and those are important considerations and constraints for the project.”



Mission	Preliminary Design	Detailed Design	Assembly and Test		Cruise	Science Operations	Extended Science Ops
	Preliminary Design Review	Critical Design Review			Launch	Mars Orbit Insertion	



Senior members of the Emirates Mars Mission team

As we alluded to earlier on in the piece, the team ethic and the morale on the Emirates Mars Mission is very high. Often in a high-pressure working environment, tension can be palpable, but there is a sense of calmness and happiness within the offices. This is something Omran is quick to identify the reasons for, too humble to take credit for it himself.

“The team is always really busy, and they really do give up such a lot of their personal time to make sure that we’re on track and working towards achieving the targets that the government have set. When you talk about the spirit and the morale you can see here today, a visit like the one we had from Sheikh Mohammed, where he met the whole team, he spoke to each of them, he was sitting in a meeting room with all of them; these things are a privilege, and an experience like that really helps to boost the team and the morale you know?”

“They know it’s not just about the space centre, it’s not about the UAE space programme, we’re talking about a mission that since it was announced, we’ve started seeing shifts here in the UAE. We’ve started seeing new curriculums being introduced in schools, we have new programmes being introduced in universities – science-based programmes. And they didn’t have those before, because they didn’t have an incentive to do that before, but now they do.

“We have students that have started changing majors from something like international relations or finance and accounting to maths, physics and chemistry. We’ve seen

‘ *It’s about the whole nation, and causing a cultural shift in the region* ’

Omran Sharaf

that happening. So that shift that’s taking place, the shift in culture, the involvement of the youth of the UAE – these things make the team really appreciate the mission and understand what this mission is about. It’s not about space, it’s about the UAE, it’s about the region.

“Now we see in the region people are talking differently. Before when people used to speak about our region, the language was very different. They would speak about the challenges and the difficulties. Now we see them talking about hope, about youth, about moving forward and being positive. I’m not saying there’s no challenges in the region, of course there are still big challenges, but there’s that visible shift in mentality that we see, which is good, and it’s the message of this mission. So all these things are helpful in boosting the team’s morale and to keep us on track so as we can deliver what the government is expecting us to do.”

And what the government expects the team to do, is deliver the most advanced scientific project the nation has ever embarked upon, as does - in light of the media furore surrounding it – the nation, the region and the world. The

burden of expectancy can weigh heavy upon even the broadest of shoulders, and this is perpetuated perhaps by the success rates of previous missions. For those unfamiliar with human space exploration – Mars is statistically the hardest. 50% of all the missions sent there in 50 years have ended in failure. Many of these failures have come from nations with an extensive history in deep space exploration. Many of the failures came on missions that took upwards of 10 years to plan and design, and many of them quite crushingly failed upon arrival to the Red Planet, not during launch, but right at the moment the science was due to start. This will be the UAE’s first mission into deep space, and they will have had a total of six years to plan and manufacture it come 2020 and the launch date. It is beyond ambitious. And so, we wonder, how is Omran giving the mission the best possible chances of succeeding, not only in terms of meeting the demanding deadline, but in making sure the probe works properly and that the mission can be a success?

“Well, it’s that history of difficulty in what we’re trying to achieve that is putting us outside our comfort zone. One thing about the UAE and about Sheikh Mohammed, is that he will always put you outside of your comfort zone. It’s meant that in our approach to this we’ve had to be innovative and creative. We didn’t come up with something where we’ve started it from scratch, we started where others have ended and we’ve learned from those experiences and hopefully others will learn from our mission in the future. By doing that we’ve tried to minimise the risks within the mission and mitigate those kinds of risks of failure.

“We have academic partners that we’re working with who have worked in space science and space technology for more than 60 years. We’ve made sure to partner with the right people and that’s where we gain the knowledge from. We transfer it to the UAE and make sure we learn from any mistakes that have happened in the past. All we can do is try to minimise those risks.”

Partners including some of the leading academic institutions working in space in America provide guidance and support, where needed, on any issues that arise. They also helped the team to pick the specifics when it comes to the science, the findings and the instruments needed to deliver new and complementary data that helps grow the scientific understanding of the Red Planet. Because while much has been uncovered, more remains hidden. We know the land is now barren, probably as a result of atmospheric decay from escape to space. This means the

surface, unlike ours on Earth, has been left exposed to harmful radiation from the Sun, because the atmosphere – the thin protective layer that keeps life in check here, has all but gone on Mars. The question is why...

"This is the thing about Mars, we've answered a lot of questions, but there are far more that remain unanswered, and with each answer comes more questions. That's one reason why we've chosen to study the atmosphere, because of the sheer volume of questions that remain. We have bits and pieces, and we can say maybe or perhaps this or this happened. And that's why what we're doing, it complements other studies and other missions. Having more data will help us understand the atmosphere more and understand the reasons why it isn't what it used to be.

"I can't say the data we collect will answer specific questions, such as the reason for the atmosphere escape to space on its own, but when it's added and collated to the data the scientific community around the world already has, it will help us to see the bigger picture..."

And so as we enter the next phase of the Emirates Mars Mission, we consider that the project is already at an advanced stage, that the publicity increases almost daily, and that

millions of young Arabs are looking excitedly and expectantly at Omran and his team to deliver what would surely be the greatest ever achievement by an Arab nation. So how does that affect him personally, and how has he changed since taking charge of this project nearly three years ago?

"It's definitely been a huge learning experience for me. I've been exposed to things that I'd never been exposed to before, when it comes to the challenges particularly. I'm not just talking about the engineering challenges, also the administrative challenges. I'm an engineer, so we like to develop things and design things, but then there are other aspects that you have to place your focus on, especially as the project manager of the team. The team culture, that's very important. Managing the priorities, identifying risks that might not seem

too important to you as an engineer, but as a project manager you'll say to yourself that's actually very important and I need to keep an eye on that. This project, as I said, is not about building a spacecraft, it's beyond that.

"I'm expected not just to deliver a spacecraft to Mars, I'm expected to prepare a generation of scientists and engineers capable of building this and other sectors in the UAE. Part of my role is also to help or promote the spread of the research and development culture in the UAE, so we talk about the shift in the mentality, the shift in interest amongst the youth, I have to support the government as project manager of this mission in making changes in the region. In sending that very strong message to the young people of the region – that if the UAE is capable of sending a mission to Mars in less than 50 years, then you can do much more than that, you know?

"Everyone on the mission feels the pressure, we all know that pressure exists. But you have to stay focused, know your priorities and always look to 2020 (the launch) and 2021 (the arrival at Mars), always have that as the focus. Remind yourself that what you're doing is not about you, it's not about the team, it's not about the centre; it's about the whole nation and causing a cultural shift in the region." ■

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Omran Sharaf

