

# The AMADEE-20 Mars Simulation

15OCT-15NOV2020, NEGEV DESERT, ISRAEL



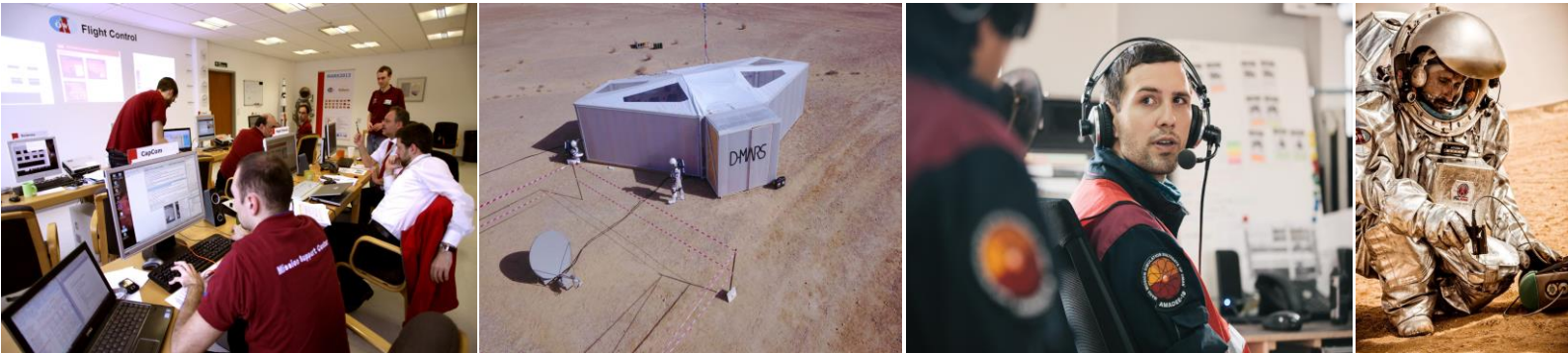
AMADEE-20 is a Mars analog simulation in the Negev Desert, Israel, managed by the Austrian Space Forum hosted by the Israeli Space Agency: For 4 weeks, a carefully selected crew of 6 analog astronauts will emulate selected aspects of a human Mars mission in the Ramon Crater, Negev desert as a topographic and geological model region for the Red Planet.

The crew will be supported by a Mission Support Center in Austria, mimicking the “ground segment” of an actual Mars mission, including operations teams, flight planners, remote science support and the infrastructure necessary to coordinate a complex set of experiments in the fields of engineering, geoscience and human factors. It is the 13<sup>th</sup> mission of its kind managed by the Austrian Space Forum.

## MISSION AIMS

- Study equipment behavior involving the simultaneous deployment of instruments and robotic vehicles with humans-in-the-loop, including research-grade spacesuit simulators,
- develop platforms for testing life-detection or geoscientific techniques, robotic support tools providing a high situational awareness,
- catalyze the visibility of planetary exploration,
- evolve the know-how of managing crewed missions to Mars by deploying a realistic Mission Support decision making framework.





## TIMELINE

<b>Nov2019</b>	Experiment interactions defined, preliminary mission definition, release of the first iteration for the AMADEE-20 Mission Manifest (the main expedition planning reference document)
<b>21-23May2019</b>	Dress Rehearsal I: Hardware arrives in Austria for first integrated hardware tests and procedure training; Mission Support Center facility set-up, team training
<b>10-12Jul2020</b>	Dress Rehearsal II: Final version of experiment hardware in Austria, team SOP training
<b>28-30 Aug 2020</b>	Dress Rehearsal III: Integrated dry-run of all mission elements
<b>Sep2020</b>	Shipping to test site
<b>15Oct-15Nov2020</b>	<b>AMADEE-20 Field Mission</b>
<b>Dec2020-Jan2021</b>	Return of hardware to Innsbruck, shipment back to home institutions
<b>May2021 (tbd)</b>	AMADEE-20 Science & Technology Workshop (location tbd)

## ABOUT THE AUSTRIAN SPACE FORUM

The Austrian Space Forum (Österreichisches Weltraum Forum, OeWF) is an organization of engineers, scientists and people with a passion for space. The research organization is involved in cutting-edge space exploration research. So far, the OeWF has led 12 international expeditions in Mars-like regions, such as the Northern Sahara of Morocco, USA/Utah, southern Spain or Oman as well as high altitude missions on glaciers.

## JOURNAL REFERENCES

- Groemer, G. et al. (2016): The AMADEE-15 Mars Simulation, Acta Astronautica, Vol 129, pp 277–290
- Sejkora, N. et al. (2018). Geodata workflow for the AMADEE-18 Mars analog mission. In European Planetary Science Congress (Vol. 12).
- Gruber, S., Grömer, G., & Haider, O. (2019). Inspiring the next generation through the AMADEE-18 MARS analog simulation. Acta Astronautica 164 (204-211).



#### MEDIA REFERENCES

- CNN on the OeWF AMADEE-18 expedition: <https://edition.cnn.com/2018/02/28/middleeast/mars-oman-mission-oeff/index.html>
- BBC about the Rio Tinto Mission: <http://www.bbc.com/news/science-environment-13161635>
- NBC on astrobiology research at the Austrian Space Forum: [http://www.nbcnews.com/id/43549253/ns/technology\\_and\\_science-space/t/how-do-you-keep-spacesuits-germ-free-mars/#.WGPbw1ynznM](http://www.nbcnews.com/id/43549253/ns/technology_and_science-space/t/how-do-you-keep-spacesuits-germ-free-mars/#.WGPbw1ynznM) Headline 1
- Haaretz: <https://www.haaretz.com/middle-east-news/MAGAZINE-oman-desert-hosts-field-tests-for-manned-mission-to-mars-1.5805659>

#### AMADEE-20 CONTACT / AUSTRIAN SPACE FORUM

Dr. Gernot Groemer, [gernot.groemer@oeff.org](mailto:gernot.groemer@oeff.org), Sophie Gruber, [sophie.gruber@oeff.org](mailto:sophie.gruber@oeff.org)

Etrichgasse 18, 6020 Innsbruck, Austria





AMADEE-20 EXPERIMENT (TENTATIVE LIST, SUBJECT TO CHANGE)

Name	Description	Institution
<b>MICROBIOM</b>	Investigating the development of astronauts microbiome during and after an isolation mission	<ul style="list-style-type: none"> <li>Research Unit Comparative Microbiome, Helmholtz Center Munich, Germany</li> <li>Tech. Univ. Munich, Germany</li> </ul>
<b>MSG</b>	Data collection on social density and spatial density in the Mars base habitat	<ul style="list-style-type: none"> <li>Eco-encounter therapy program in ENAV NGO, Israel</li> </ul>
<b>ACT</b>	Utilizing Acceptance and Commitment Therapy (ACT) to improve psychological flexibility, performance & error measures	<ul style="list-style-type: none"> <li>Goldsmiths University of London, UK</li> </ul>
<b>AEROSCAN</b>	Test an autonomous solar-powered Vertical take-off and Landing (VTOL) drone for the Martian surface analysis	<ul style="list-style-type: none"> <li>University of Houston, USA</li> <li>Airvision srl, Italy</li> </ul>
<b>AMAZE</b>	Visual-inertial Navigation for aerial Planetary Exploration for the NASA MARS2020 mission	<ul style="list-style-type: none"> <li>Univ. of Klagenfurt, Austria</li> </ul>
<b>SHARE</b>	Situational awareness testing of analog astronauts during extra-vehicular activities	<ul style="list-style-type: none"> <li>Ecole Nationale Supérieure de Cognitique, Bordeaux INP, France</li> </ul>
<b>SANDEE</b>	Sand transport during aeolian processes in the Negev Desert: Electrical Effects and implications for Mars	<ul style="list-style-type: none"> <li>Interdisciplinary Center (IDC) Herzliya, Israel</li> <li>Ben-Gurion Univ. of the Negev, Israel</li> </ul>
<b>MARSEQ</b>	Sequencing of DNA-based life in Mars-like environments	<ul style="list-style-type: none"> <li>Universities of Innsbruck/Austria, Uppsala/Sweden, Wisconsin/USA,</li> <li>Joint Genome Institute, Berkeley, USA</li> </ul>
<b>MICRO-POTENTIAL</b>	Evaluation of Microbial Potential Contamination & DNA analysis of contamination vectors	<ul style="list-style-type: none"> <li>Dead Sea and Arava Science Center</li> <li>Tel Aviv University</li> <li>Weizmann Institute of Science, Israel</li> </ul>
<b>HUMAIN</b>	Human- Machine Interface Research for Space Suit Head-Up Displays	<ul style="list-style-type: none"> <li>Austrian Space Forum, Austria</li> <li>Delft Univ. of Tech, The Netherlands</li> </ul>



<b>MEROP</b>	Remote operation of planetary ground robots using advanced human-machine interfaces	<ul style="list-style-type: none"><li>• University of Lisbon, Portugal</li></ul>
<b>PROB.POOP</b>	Effect of Environmental Stressors on Frequency and Consistency of Bowel Movements among Mars Analog Crew	<ul style="list-style-type: none"><li>• Norwegian University of Science and Technology, Norway</li></ul>
<b>PSYCHSCALE</b>	Human Performance Evaluation of Environmental Stressors via Anonymous Standardised Psych. Assessment	<ul style="list-style-type: none"><li>• International Space Univ., France</li><li>• University of Cadiz, Spain</li><li>• NTNU, Norway</li></ul>
<b>VFR-eFAST</b>	Feasibility of focused ultrasonography of the abdomen and thorax (eFAST/Trauma)	<ul style="list-style-type: none"><li>• Lindesberg Hospital, Sweden</li><li>• Univ. Hospital of Cologne, Germany</li><li>• European Society of Aerospace Medicine, Germany</li></ul>
<b>TUMBLEWEED</b>	Student experiment on a wind-driven sphere with environmental sensors	<ul style="list-style-type: none"><li>• Austrian Science and Engineering Students</li></ul>

