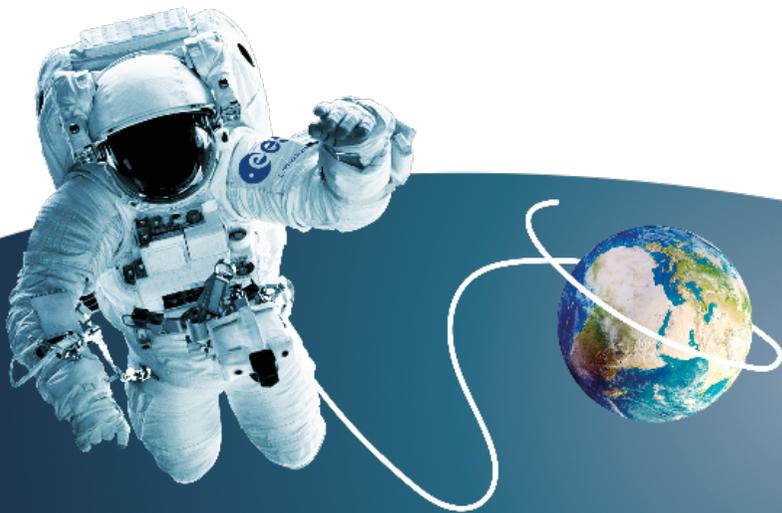




CREATING
A CIRCULAR
FUTURE

Consolidating the Swiss activities and rationale for ALSS and MELISSA development

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Swiss Position Paper on Advanced Life Support Systems (ALSS) – 08.2019

- Elaborated in the context of the preparation for the held ESA Ministerial Council Space19+
- Supported by   
- Objectives:
 - to develop an ALSS roadmap, encompassing the three main pillars of the Swiss Space Policy
 - to demonstrate that ALSS developments would be enhanced by a concerted effort from the Swiss parties, especially within the framework of MELISSA
- Over twenty Swiss stakeholders active in the field of ALSS expressed their strong interest in MELISSA project by endorsing the Position Paper



www.melissafoundation.org/news/consult/24





Organisations that endorsed the Swiss Position Paper on ALSS and MELISSA development



Lucerne University of Applied Sciences and Arts



Technik & Architektur Institut für Medizintechnik





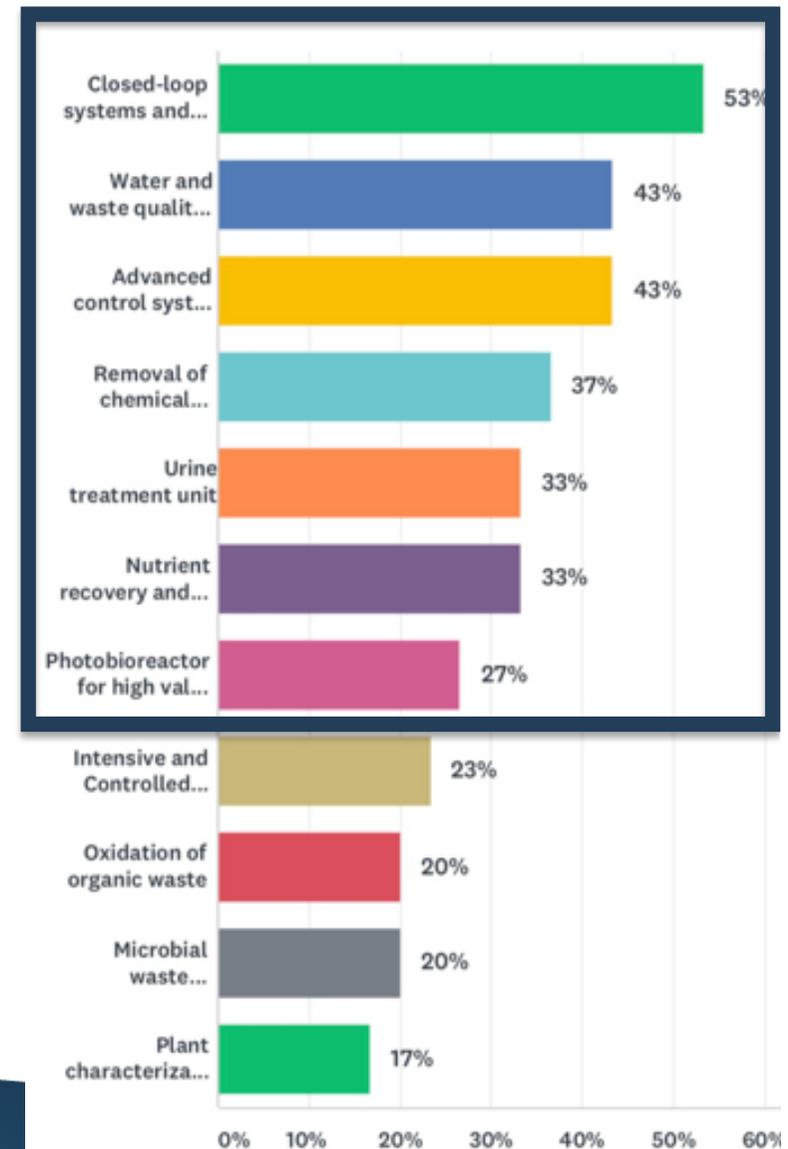
Survey results (filled by 35 Swiss organizations)

- Swiss MELiSSA and ALSS stakeholders:
 - encompass a broad range of public and private organisations
 - exhibiting diverse and complementary scientific and technological skills and know-how
- Emerging and dynamic Swiss ALSS community
 - reached a critical size and momentum
 - gained a clear perception of MELiSSA
 - demonstrate a precise understanding of potentials for collaboration
 - active participation: > 30 R&D and technology transfer projects, covering most of the dimensions and topics of investigations on ALSS
 - significant potential for increased level of scientific and technical collaborations



Which MELISSA techno connected to organisation activities?

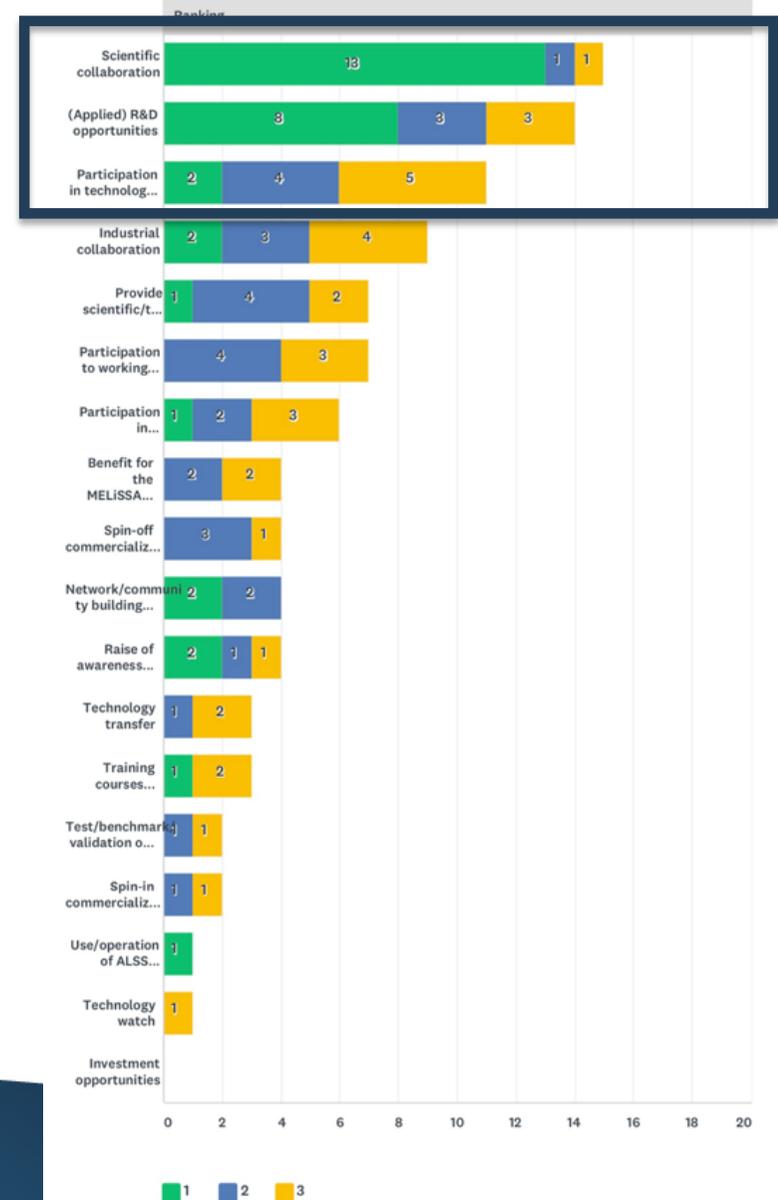
- Closed-loop systems and circular ALSS
- Water and waste quality analysis
- Advanced control systems (e.g. model based)
- Removal of chemical contaminants
- Urine treatment unit
- Nutrient recovery and delivery
- Photobioreactor for high values compounds and/or food production (incl. biofacades)





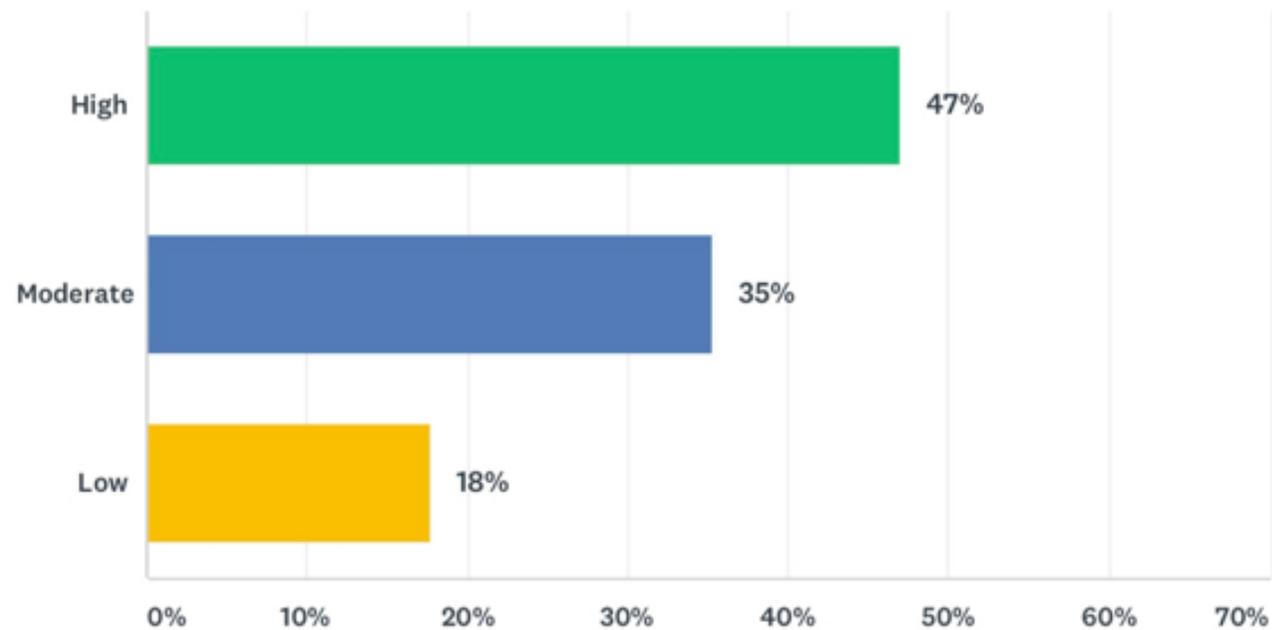
Top interests

- Scientific collaboration
- (Applied) R&D opportunities
- Participation in technology demonstration/showcase





Potential to set up new collaborations on ALSS/MELISSA activities within the next 2 years?





Mapping of ALSS and MELISSA-related activities implemented in Switzerland

- By category: basic R&D; flight experiments; ground demonstration; terrestrial applications, education and communication
- Key MELISSA-related laboratories/research groups and private organizations
- ALSS-related research organizations, space and innovation agencies
- Swiss strengths in space and terrestrial ALSS/MELISSA-related activities
- Concrete examples of ALSS and MELISSA accomplishments “made in Switzerland”



Examples of Basic R&D activities

- 4 MELISSA-related **PhD projects**
 - Eg. Higher plant modelling of wheat root plasticity under nutrient deficiencies (ETHZ)
 - Eg. Nutrient recovery from urine in space (Eawag)
- 2 MELISSA-related **post-doc projects**
 - Eg. Closing anthropogenic carbon loops: towards implementing a circular economy (UNIL)
- **BELISSIMA phase A** (2016-2019); VITO (prime contractor), ESTEE SA, UNIL and UGent (subcontractors)
- **Space Loop**. Pyrolysis of human feces (ZHAW)
- **EnRUM - Energy Resources Utilization Mapping**, led by Sherpa and CSEM (2017)
- **MELISSA Food Characterization Phase 2** (IPL, HES-SO Valais, RUAG Space)

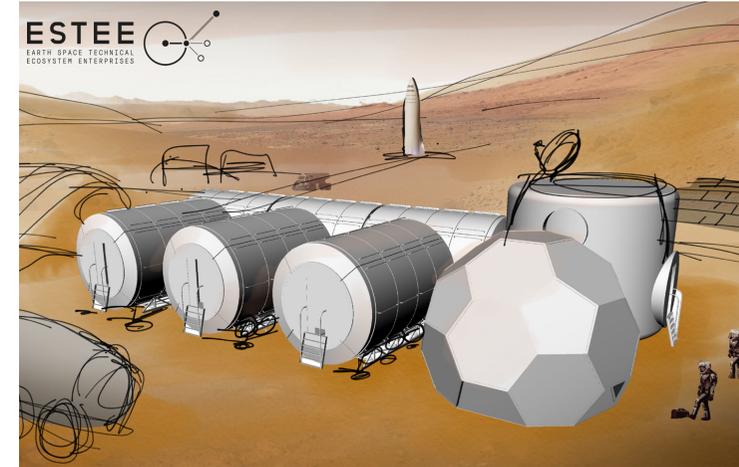


Oikosmos report
Convergence of terrestrial and space research agendas



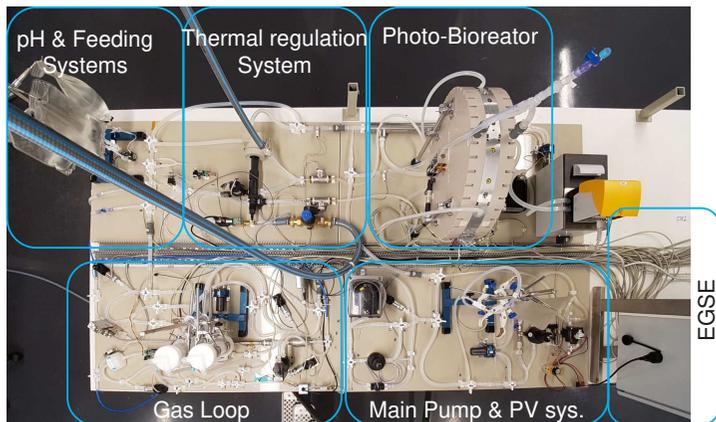
Ground demonstration

Scorpius Prototype 1

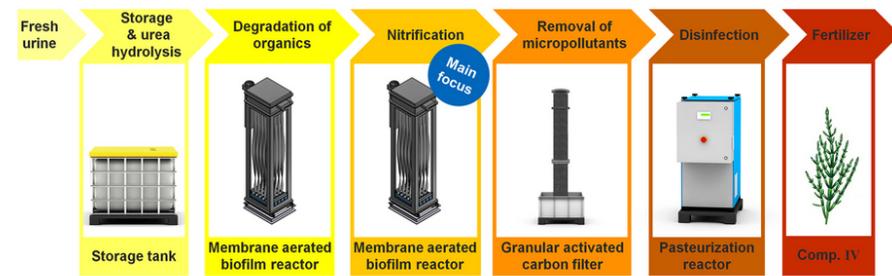


Flight experiments

Space Bioreactors
BIORAT-1: Bread-board Model



Terrestrial applications



Heavy metals (not present in urine)	
Smell, volatile ammonia	X
Pharmaceutical residues	X
Pathogens	X
Macro-nutrients (e.g. nitrogen, phosphorus, potassium) and micro-nutrients (e.g. zinc, boron)	✓



Considerations from the Swiss ALSS community

Maintain current political support with long-term vision and planning in order to:

- investigate topics relevant both for human space exploration and for their associated Earth-based applications
- attract and increase engagement of the Swiss non-space ALSS organisations in space exploration
- enhance synergies between Swiss players and the MELISSA community (incl. targeted workshop reporting on both MELISSA and national activities)
- develop a dedicated testbed in Switzerland to experiment with ALSS concepts



ALSS has now gained a growing importance in the Swiss space sector landscape

10-11.2020



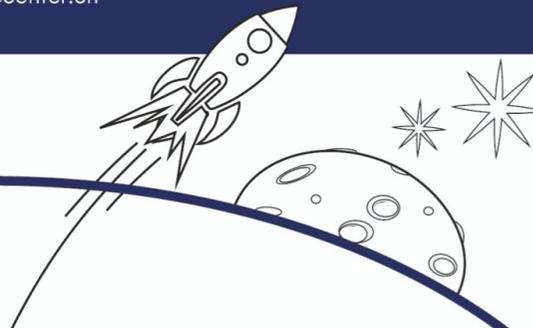
Launch your career in space!

This fall, meet ESA experts as well as Swiss space actors from industries and academia during five thematic events discussing fields of study playing a key role in the space sector. Take your chance and join the virtual events to learn more on how to launch your career in space and why the space sector needs you!

Cybersecurity	Space Law	Life Support Systems	Robotics and Photonics	Science missions: Exoplanets
26 October 17.00 - 18.30	27 October 17.00 - 18.30	28 October 17.00 - 18.30	2 November 17.00 - 18.45	3 November 17.00 - 18.30

Live on the Swiss Space Center's YouTube channel
www.spacecenter.ch

Be a star in
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Conclusions of the Position Paper

The following actions were seen as highly timely:

- consolidating the Swiss activities and rationale for ALSS into an active and productive cluster during the next European Exploration Envelope Programmes (E3P)
- positioning Switzerland as a key player in space and terrestrial ALSS with a strong potential for contributions to the developments and collaborations within the MELISSA project
- promoting the international visibility of Switzerland in the fields of manned space exploration and circular economy

In the meantime, Switzerland confirmed its position as one of the biggest national contributors to MELISSA (through EXPERT programme)



Conclusions of the Position Paper

- **Need for a resolute and continued financial support for MELISSA activities remaining within ESA (via E3P)**, in order to maintain a steady flow of collaborative partnerships and the continuity of technology development within MELISSA.
- The discussed approach does not only focus on fostering MELISSA projects within Switzerland, but also on **facilitating the emulation of such Position Paper on ALSS in other European countries.**



Connect with the Swiss LSS cluster and explore collaboration opportunities with them!



MELISSA



MICRO-ECOLOGICAL
LIFE SUPPORT SYSTEM
ALTERNATIVE

THANK YOU.

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