



RASC-AL
Revolutionary Aerospace Systems Concepts Academic Linkage



2020 RASC-AL Themes Call for Proposals

NASA is pioneering new ways to learn how to live and explore space as we extend humanity's presence further into the solar system. The 2020 RASC-AL Competition is seeking undergraduate and graduate teams to develop new concepts that leverage innovations to improve our ability to operate in space and on distant planetary bodies. This year's themes range from expanding on how we use current and future assets in cis-lunar space to designing systems and architectures for exploring the Moon and Mars. Each team's response should address novel and robust applications to support expanding humanity's ability to thrive beyond Earth.

In this year's RASCAL Competition, teams and their faculty advisors will design innovative solutions with supporting original engineering and analysis in response to one of the following five themes:

1 South Pole Multi-Purpose Rover

This theme solicits designs for a multi-purpose rover that can support robotic exploration of the lunar South Pole as well as expand a human crew's range by serving as unpressurized mobility.

2 International Space Station (ISS) as a Mars Mission Analog

In this theme, teams will develop a Mars mission analog to prove out the needed technologies for a four-crew mission to Mars. The ISS and its crew can be used to simulate the spacecraft and time spent in transit.

3 Short Surface Stay Mars Mission

Teams will design a Mars mission with a short duration surface stay. The objectives of the mission are to achieve the first human landing on another planet, and to search for life on Mars.

4 Commercial Cislunar Space Development

In this theme, teams will identify, define, and prepare a cash flow analysis for a commercial cislunar business. **Excluded** business ideas are tourism, minerals extraction, interment/burial and ISRU propellant production.

5 Autonomous Utilization and Maintenance for Science Payloads on the Gateway and/or Mars-class Transportation

For this theme, teams will develop a concept for a system that can autonomously support utilization and/or maintenance for science payloads on the Gateway and/or Mars-class Transportation.

Special Note: *proof of concept via an advanced VR simulation or prototype of the proposed capability is required for this theme. Up to \$5,000 in extra stipend funding will be available for prototype development.*

These are abbreviated theme descriptions.* Please visit the themes webpage on the RASC-AL website for complete details, constraints, and requirements for each theme. <http://rascal.nianet.org/themes>

*NASA reserves the right to reduce the number of themes, based on the number of NOI responses.



For all RASC-AL Projects, special attention should be given to:

- Synergistic applications of NASA's planned current investments
- Supporting engineering analysis
- Unique combinations of the planned elements with new innovative approaches/capabilities/technologies to support crewed and robotic exploration of the solar system
- Realistic assessment of costs for technology maturation, system development, and production and operations

Key elements that each RASC-AL project will be evaluated on:

- Adherence to the requirements and constraints of the selected topic and the design competition
- Synergistic application and supporting original engineering analysis of innovative approaches, capabilities and/or new technologies for evolutionary architecture development to enable future missions, reduce cost, and/or improve safety
- Technical merit and rationale of mission operations in support of an exciting and sustainable space exploration program
- Key technologies, including technology readiness levels (TRLs), as well as the systems engineering and architectural trades that guide the recommended approach
- Reliability and human safety consideration in trading various design options
- Realistic assessment of project schedule and test plan, as well as realistic development and annual operating costs (i.e., budget)
- Realistic assessment of partnering and cost sharing scenarios based upon commercial profitability and the ability of international partners to participate given their limited budgets

Important Dates:

- Notice of Intent (NOI) Deadline: October 15, 2019
- Proposal and Video Deadline: March 5, 2020
- Selection Notifications: March 30, 2020
- Technical Paper Deadline: May 28, 2020
- 2020 RASC-AL Forum: June 15 – 18, 2020

Eligibility

RASC-AL is open to full-time undergraduate and graduate university-level students studying fields with applications to human space exploration at an accredited U.S.-based university. Teams must contain, at a minimum, one faculty advisor and 2 students from a U.S.-based university. (See RASC-AL website for full eligibility requirements).

Participation Awards & Prizes

Teams selected to present at the 2020 RASC-AL Forum will receive up to \$6,000 to facilitate full participation in the RASC-AL Forum. Additional prototype development stipends of \$5,000 may be awarded to selected teams in Theme 5.

The top two overall winning teams will be awarded with a travel stipend to present their concept at an aerospace conference in 2020.

RASC-AL Overview

RASC-AL competitions fuel innovation for aerospace systems concepts, analogs, and technology prototyping by bridging gaps through university engagement. RASC-AL projects allow students to incorporate their coursework into real aerospace design concepts and work together in a team environment. Interdisciplinary teams are encouraged.

RASC-AL is managed by the National Institute of Aerospace on behalf of the National Aeronautics and Space Administration

<http://rascal.nianet.org>

