MAE 434W/435
Senior Design Project

Title:
RASC-AL 2015 Earth Independent Mars Pioneering Architecture

Description:
NASA's Revolutionary Aerospace Systems Concepts—Academic Linkage (RASC-AL) is soliciting proposals for the **development of a sustainable crewed Mars base architecture that can sustain a permanent, 24-person crew (6-year rotations) on the Martian surface by 2055**. Nationally, up to 18 teams, with up to 12 team members, will be selected and those design teams will be invited to present their results and participate in a forum to be held in Cocoa Beach, Florida next spring. Final details will be available on the RASC-AL 2015 web site by September 1. In the meantime, you can go to http://nia-cms.nianet.org/RASCAL/Program-Info.aspx for eligibility and deliverable requirements.

NASA would like the Mars base to operate with virtually no reliance on terrestrial resupply (cargo deliveries can be expected once every 27-months). A major component of the overall architecture is the development of fully-autonomous systems that can utilize local Mars material as feedstock to produce a range of consumable products, ranging from breathable air and drinking water to food and rocket propellant. Other considerations include: (1) Mars base habitats that can shield the occupants from harmful radiation; (2) development of a food supply that won't require a dedicated "farmer"; (3) development of transportation systems that can provide crewed access to the most-distant locations on the Martian surface; (4) robotic construction vehicles and fully-autonomous construction and resource extraction operations; (5) development of the infrastructure (roads, electric power, waste disposal, etc.) required to operate a permanent crewed base.

The design team will be expected to develop an overall strategy for achieving a sustainable base within 40 years, identifying key technology developments that will be required on a timeline designed to achieve the ultimate goal of a permanently-crewed base. Consideration should be given to staying within current NASA budgetary constraints over the 40-year development period. After developing a "big picture", the design team members will be expected to focus on innovative ideas related to the development of specific hardware elements that could accelerate the base development timeline or reduce overall costs.

Number of students needed:
Seven to 12—possibly two design teams

Suggested by (Faculty): Robert L. Ash	**Supervised by (Faculty):** Robert L. Ash

Semester:
Fall 2014