Welcome

As you enter, please type your name and school into the chat

This webinar will be recorded.

You are welcome to keep your camera off if you prefer or you may leave and review the webinar later when it is posted to the Tools and Tips section of the FNL Website.

Mars / Moon Challenge Webinar

Mark Abotossaway
Blue Origin Engineer and FNL Assistant

ARTEMIS STUDENT CHALLENGES
nasa.gov/stem/artemis.html

NASA Partner

The material contained in this document is based upon work supported by a National Aeronautics and Space Administration (NASA) grant or cooperative agreement. Any opinions, findings, conclusions or recommendations expressed in this material are those of the author and do not necessarily reflect the views of NASA.

Meet the FNL Team

Wisconsin Space Grant Foundation

• Kevin Crosby, Director	kcrosby@carthage.edu
• Christine Bolz, Assistant Director	cbolz@carthage.edu
• Rob Cannon, FNL Project Manager	rcannon@carthage.edu
• Connie Engberg, Project Support Assistant	cengberg@carthage.edu
• Megan Goller, Accounts Assistant	mgoller@carthage.edu

First Nations Launch

• Frank Nobile, Technical Coordinator, Wisconsin Tripoli	maxq3@aol.com
• Mark Abotossaway, Project Assistant/Advisor Liaison, Blue Origin (Alumni)	mark.a.abotossaway@gmail.com

Tripoli Rocket Association

• Bob Justus, Tripoli Assistant, Illinois Tripoli	bob@mhbofni.com
• Kevin Harnack, Tripoli Assistant, Wisconsin Tripoli	

Overview

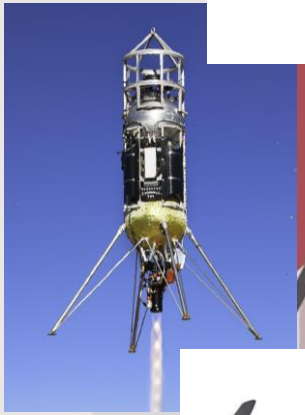
- Payload Requirements
  - Chassis
  - Electronics
    - Transmitter / Receiver
    - Electric Motors
    - Propellers
    - GPS
    - Camera
  - Integration
  - Deployment
  - Control

Challenge Payload Chassis

- Teams must fabricate a drone chassis
  - Teams must first design a chassis
    - **Proposal Report** should present at least 2 variations
  - Typical chassis should have:
    - Body – houses the electronics
    - Arms (Mars) – houses the motors / propellers
    - Legs (Moon) – allows for stable landing
    - Landing gear – allows for stable landing

Challenge Payload Chassis

- Teams must fabricate a drone chassis
  - Chassis design may be based off existing COTS chassis
    - Research existing chassis possibilities
    - Unique designs / features would need approval
    - If COTS chassis parts are used;
      - Points will be deducted
  - Chassis material may be;
    - 3D printed, composite, metal
    - Unique materials would need approval



Challenge Payload Chassis

- Additional Chassis Requirements
  - Chassis must be ‘retractable’
    - Able to fit inside of rocket vehicle airframe
    - Orientation of retraction is not restricted
    - This will apply to ‘arms’ or ‘legs’
    - Use CAD models for spatial integration
  - Chassis must also have:
    - Ability to attach / release drogue parachute

Challenge Payload Chassis

- Size / volume / weight are key design drivers
  - Size is restricted to:
    - Circular cross section 8-inch (folded)
  - Volume is restricted to:
    - Cylindrical with variable length
  - Weight is restricted to:
    - Range 1 – 3 lbs
- Component selection drives chassis design
  - Do not restrict component selection
  - Do not restrict chassis design
  - Parallel iterative design / selections

Challenge Payload Electronics

- The following electronics are required
  - Radio Transmitter
  - Radio Receiver
  - Electric Motors
  - Propellers
  - GPS System
  - Camera System

Challenge Payload Electronics

- Radio Transmitter / Receiver
  - Can buy separately
  - Can strip / use COTS components

  - Cost / Performance are selection drivers

Challenge Payload Electronics

- Motors / Propellers
  - Can buy separately
  - Can strip / use COTS components

  - Cost / Performance are selection drivers
  - Ensure you get the right power / size

Challenge Payload Electronics

- Camera Transmitter / Receiver
  - Can buy separately
  - Can strip / use COTS components
  - Cost / Performance are selection drivers
  - Some radio controllers:
    - include the camera screens
    - Use cell phone as camera screen
  - Can use high end FPV goggles

Challenge Payload Integration

- Payload integration refers to:
  - Installing Challenge Payload securely inside the vehicle
  - Ensuring Challenge Payload is ready for deployment / control

- Vehicle / Payload should use a sabot or piston
  - To protect the payload during flight
  - To protect the payload during deployment

Challenge Payload Deployment

- At apogee, the Challenge Payload must deploy
  - Team must propose a suitable electronic device to initiate deployment
    - Deployment cannot be accomplished with a vehicle parachute deployment
      - The drogue & payload are on opposite ends of the vehicle
    - Electronic device may sit in the payload or on the vehicle
  - The mechanical means for deployment can be
    - Energetics (black powder, pyrodex, CO2) or mechanical
  - All components (nosecone, sabot, piston) must;
    - Be tethered or have its own parachute

Challenge Payload Deployment

- At apogee, the Payload must deploy
  - The Challenge Payload must deploy
    - With a drogue parachute open on deployment
  - The Challenge Payload must
    - Release the parachute at 500 ft AGL*
  - As such, the Challenge Payload must
    - Contain a mechanical device to hold / release a parachute
    - Contain an electronic device to trigger the release
  - ***MOON teams will not release the parachute**

Challenge Payload Control: Mars

- At 400 ft AGL, the Challenge Payload must begin controlled flight
  - Pilot must:
    - Prepare for flight after apogee (Payload Deployment)
    - Ensure the Payload is ready for flight prior to parachute release
    - Ensure the Payload is in upright orientation (with camera)
  - Pilot must power up motors and propellers
    - At or above 400 ft AGL
  - Pilot must fly the drone, by line of sight or camera assistance
    - In the most direct path, to the landing zone

Rocket Vehicle Requirements

- The Requirements here are specific to the Challenge
  - There are standard Vehicle Requirements outlined in the Handbook
- Rocket Vehicle must
  - Use 7.5- or 8-inch diameter airframe for payload section
    - Will be variable length, depending on your payload
  - Teams may fabricate their airframe if desired
  - Teams may ‘transition’ to smaller diameter airframe for booster
    - To save weight / cost
- Satisfy performance requirements with your selections
  - Simulate, simulate, simulate

Questions?