USC SPACE ENGINEERING RESEARCH CENTER
“INTRODUCTION TO RESEARCH DAY”
6 AUGUST 2020

Prof. David Barnhart, Director
http://serc.usc.edu
barnhart@isi.edu
310-448-8644
Goals for Today

• Introduce basics of SERC
  • *What it is*
  • *How to Participate*

• Current Research Projects going into Fall

• Call for New Researchers
  • *Expectations to Apply*
  • *Expectations on Work ethic and Activities under Covid-19*
USC’s Space Engineering Research Center: What is it

- **Astronautical Engineering (ASTE)**
  - Bachelor of Science
  - Bachelor of Science Minor
  - Master of Science
  - Engineer
  - PhD
  - Graduate Certificate

- **Information Sciences Institute**
  - Part of USC’s Viterbi School in Marina del Rey, Arlington, VA, and Waltham, MA
  - >$80M/year from diverse sponsors
  - ~300 people, 2/3rds research staff
  - Facilities for export or restricted research

An academic industry membership run

“Space Engineering Teaching Hospital”

~200 undergrad, graduate and PhD. students involved in all aspects of hands-on space engineering to-date
Where is SERC in USC’s “Space EcoSystem”

SERC Engineering Offices & Labs (at ISI)

Rocket Propulsion Lab

Satellite Ground Communication Station

Space Sciences Center

USC Main Campus Astronautics Department

Institute for Creative Technologies, (Army UARC)
History and how do Student’s Participate?

- **History**
  - Work at ISI started in 2006 with US Government and Industry contracts
  - Started as Center in 2007 with ASTE
  - Funding through variety of sources
    - Restricted Gifts
    - USG research contracts and grants
    - Industry research contracts

- **Student Researcher Makeup**
  - High School Students (~4/year)
  - Undergraduates (~15-20/year)
  - Masters Students (~30-40/year)
  - PhD’s (~2/year)
  - International Visiting Students (~5/year)

- **Ways to Participate as a Student**
  - Volunteer
  - Directed Research
  - ASTE 291/491 Project Class
  - Paid Projects
  - GRA

- **In Fall 2019, 80 applications for SERC Positions!**
SERC Publications and Presentations

SERC Paper and Publications

- **Yearly Papers/Pubs**
- **Cumulative**

---

**2020**

---

**2019**

---

**2018**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 10th AIAA SPACE 2018:

---

**2017**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 9th AIAA SPACE 2017:

---

**2016**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 8th AIAA SPACE 2016:

---

**2015**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 7th AIAA SPACE 2015:

---

**2014**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 6th AIAA SPACE 2014:

---

**2013**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 5th AIAA SPACE 2013:

---

**2012**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 4th AIAA SPACE 2012:

---

**2011**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 3rd AIAA SPACE 2011:

---

**2010**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 2nd AIAA SPACE 2010:

---

**2009**
- Karayanis, S., and Jumma, K., "Moving Object Motion Prediction Using Real-Time Spacecraft Trajectory Data," 1st AIAA SPACE 2009:
SERC Operations encompass all levels of Research

Range of Partnerships and Sponsors

• From “Fundamental Research” to “Export control”
  • *ISI* is setup to handle restricted and proprietary research activities
  • SERC facilities handle full range, and enable student participation
• SERC Student population ranges from US Citizens to International Students
  • E.g. Italian MS, French AF Academy Seniors, Mexican MS, Canadian PhD’s etc
• Full cost accounting and reporting on projects
• Range of sponsorships from USG to Private Organizations to Grants
  • Northrop Grumman, Parabilis, Palski Associates, Honeybee Robotics, JPL, NASA, DARPA, Boeing, Disney, etc.
SERC emphasis is “hands-on”... applied research focus
SERC fabrication and integration facilities

Machining Equipment
CNC Mill and Lathe
3D printers
Basic electronic equipment and Flight Wire stores
Optical Table
5k compressor
Class 100k Cleanroom

Current Lab Space:
- 2 Electronics Labs
- 1 Integration and Test Lab

Current Engineering Spaces:
- Seating for up to 15 students at one time
- Conference Room facilities available

Analysis Tools include STK, ESATAN, NX Suite, Solidworks Suite
SERC PCB Board Development, Detailed Soldering Station

- Miniature 3D Printer
- PCB Board Laser Cutter
- Electronics Board Reflow Oven
- Soldering Station, Microscope, Dual Metcal Fine Solder
- New for 2020:
  - Pick and Place PCB machine (wish list!)

Design Tools include CADENCE, OrCad, KiCAD, Eagle
SERC Research encompasses range of Spacecraft Engineering and Tech Innovation

- Spacecraft Simulation, Coding, Build/Fly
- Ground and Flight Communication
- RPO Technologies and Techniques
- Swarm and Cellular Aggregation
<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Researcher Needs</th>
<th>Location</th>
<th>Special Reqmts</th>
</tr>
</thead>
</table>
| PINACAL      | LED-Optical Based Human Circadian Rhythm Correction Device                   | - EE design for miniature systems  
                        - Light and optics design  
                        - Analytics for human subject testing                                        | MdR       |                                                                                      |
| CLING        | Genderless RPO and Docking Device                                           | - Project lead  
                        - Electro-mechanical system lead  
                        - Miniature Board design                                                       | MdR       |                                                                                      |
| STARFISH     | Soft Robotics Inspection Device                                             | - Project Lead  
                        - Miniature Electro-mechanical systems  
                        - Silicon or soft robotics locomotion                                          | MdR       |                                                                                      |
| HORIZON DRIVE| Experimental testing of new propulsion concept with laser system            | - Laser experimenter  
                        - DAQ Experimenter  
                        - Simulation Developer                                                        | MdR and  
                                               Campus                         |                                                                                      |
| SOLID PROPULSION | Investigate low temperature solid propulsion materials properties          | - Mechanical testing engineer  
                        - Data analysis engineer                                                        | Campus,  
                                               and Adelanto Facility  
                        - US CITIZEN or Permanent Resident at Adelanto Facility  
                        - Solid Propellant experience                                                   |
## Fall 2020 Research Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Description</th>
<th>Researcher Needs</th>
<th>Location</th>
<th>Special Reqmts</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAGNETO</td>
<td>Student Built 1.5U Cubesat for Earth Magnetic Field Measurements</td>
<td>- Project Lead&lt;br&gt;- Software/Telemetry/CAD Engineers&lt;br&gt;- PCB Board design</td>
<td>MdR Facility</td>
<td></td>
</tr>
<tr>
<td>LA JUMENT (DODONA)</td>
<td>3U Cubesat with EO Payload for Experimentation of new Tech</td>
<td>- Software/Telemetry/CAD Engineers&lt;br&gt;- PCB Board design&lt;br&gt;- Integration and Test Engineers</td>
<td>MdR Facility</td>
<td>US Citizen or Perm. Resident</td>
</tr>
<tr>
<td>PHAROS</td>
<td>Two 6U Cubesats flying in Tandem with advanced EO and RF communications</td>
<td>- Project Lead&lt;br&gt;- Satellite Design/CAD Engineer&lt;br&gt;- RF/Power/Thermal Engineers&lt;br&gt;- Integration and Test Engineers</td>
<td>MdR Facility</td>
<td>US Citizen or Perm. Resident</td>
</tr>
<tr>
<td>SATELLITE TRACKING</td>
<td>Multiple opportunities to track and communicate with Satellites</td>
<td>- Ground Station Operator Lead&lt;br&gt;- Satellite Tracking Engineers</td>
<td>Campus</td>
<td>US Citizen or Perm. Resident (Lead only)</td>
</tr>
<tr>
<td>LEAPFROG</td>
<td>Lunar Lander Kit Based National Flight Competition</td>
<td>- Attitude Control&lt;br&gt;- RTOS S/W Programmer&lt;br&gt;- Flight Test engineers&lt;br&gt;- Build and Integration engineers</td>
<td>MdR Facility, Local and National RC Fields</td>
<td></td>
</tr>
</tbody>
</table>
“PINACAL: Personal Pineal Gland Light Stimulator and Regulator” (PL = Morgan Farrier)

Project: The PINACAL team will pursue a number of key deliverables;

a) Updated design(s) and prototypes for a lightweight ergonomic device conducive to Space applications, with NASA Astronaut core and other off-shift workers inputs.
b) Produce > 100 prototype units of a down-selected design for HRB trials.
c) Full test report from IRB approved first stage human trial testing. (IRB thru USC/Keck Medical School), including evaluation of spinoff commercial Earth applications.
PURPOSE:
• Upgrade existing CLING concept design with RPO level sensors
  • Build prototype and test on free floating testbed

• Project Assumptions:
  • Existing CLING design used as starting point
  • Primary Goal to provide some level of validation of concept through practical application using benchtop testing for new sensors
    • Cost is limited thus sensors will be prototype or “lab” type only
    • Timeline is to be finished with results in less than 1 year, and provide publishable results to share with community
“CLING-ERS”, An Advanced Genderless Docking System with RPO Sensors

Invented by Dr Berokh Khoshnevis
STARFISH

PURPOSE:
• Leverage EA/Gecko experience into soft robotic platform to develop new “crawling robot” for space
  • Build prototype and test in -1G

• Project Assumptions:
  • Primary Goal to provide some level of validation of concept through practical application using benchtop testing
    • Hope is that -1G will show enough capability
  • Timeline is to be finished with results in less than 1 year, and provide publishable results to share with community
Flexible materials can be used to create substrate

- Locomotion can come in multiple forms
- SERC to explore multiple methods
Initial plan is to 3D Print molds to explore creating Flexible Arms

- 3D printed molds form geometry
- Plan to explore putting in wiring during the curing process
- Tips of “feet” would be outfitted with EA/G adhesives
- Center core used for electronics, power, sensors etc
Horizon Drive Project (PL = Rahul Rughani)

- **Primary objective:** Validate theoretical application of quantized inertia (QI) thrust
- **Methodology:** Develop a high fidelity isolated measurement testbed in an ultra-high vacuum chamber (UHVC) that supports micro to nano-scale data movement.
- **Success Criteria:**
  - With a known wavelength laser, validate Unruh radiation effect, and determine how it varies with power
- **Experimental Lab on Campus**
  - Uses 5W laser with specialized Cavity mechanism to simulate Unruh Radiation
Vacuum Chamber Ports
- Different types
- Optically transmissible ports to be covered with O/D blocking materials

Laser Inlet
- Fiber optic, fully enclosed

McMaster T-Slot Framing
- Al 8020

Optical Table
- Vibration Dampened

XYZ Positioning Stage
- Allows flange to be raised and lowered (weighs 30lb and has to be held in air when fasting all 20+ bolts)
Low Temperature Solid Propulsion Investigation for Mechanical Properties (PL = Ava Badii)

PURPOSE:
Research, test and recommend changes to solid propellant makeup to support applications to -30°F

1. Determine sources of mechanical failure for low-temperature solid rocket propellant
2. Evaluate propellant formulations and experiment with different propellant chemical ratios
3. Arrive at an increase in a structural metric while maintaining performance at low temperatures
Proposed Research to support Science Goals

Task 1
- Research existing high-speed, high-altitude analysis for thermal shock into a solid rocket.
- Create basic simulation that shows expected temperature differential for the boundary conditions identified above for high speed flight.
- Identify failure mechanisms of known problems with similar systems in the past.
- Define structural and mechanical metrics that can be used for physical validation.
- Define a series of various differing mixtures, inhibitors, binders that can be tested in cast plugs that may provide the temperature results expected.
- Identify expected use cases and organizations that would be interested in the end research results.

Task 2
Casting various grain mixtures

Task 3
Solid propellant mechanical properties
- Cracks in the propellant \( \Rightarrow A_0 \Rightarrow p_s \)
- Might lead to failure
- Good mechanical properties is important
- Must be elastic
- \( T_g < \) minimum service temperature
- Good bonding to case important
- Debonding \( \Rightarrow A_0 \Rightarrow p_s \)
Exquadrum’s FORGE test facility is 7.5 acres located on Southern California Logistics Airport (SCLA), (formerly George AFB)
Optional Hot Fire Testing possible at end of effort

Option to execute hot fire test:
- With USC RPL, option to build case and insert grains after chilling to low temperature and hot fire at ExQ in test stand.
  - Would need to cast two identical, and run hot fire test in ambient and one in chilled
- Optional based on funding, timeline and labor to support hot fire testing
CUBESAT PROJECTS (PL = Eugene Park)

- Multiple Cubesat projects are underway or starting up
- New Researchers needed IMMEDIATELY for flight projects
- Flight integration occurs in Clean Room at Marina Del Rey
- Some of the Cubesat projects require US Citizen or Perm. Resident Status due to collaboration with Industry
Quick History of Satellite Projects at SERC

**2010**
- Quad Monopole Deployer & Comm
- Careus
  - Launched Successfully – Still in Orbit!

**2012**
- Small RPO Inspector Design
- Maestro Multi-Core Processor Flight Experiment
- Aeneas
  - Launched Successfully – Host S/C did not operate

**2018**
- 0.5 m RF Dish Deployable
  - Used by JPL, spun off to commercial use
- Careus
  - Launched Successfully – Host S/C did not operate

**2019**
- eXCiTe
  - Launched Successfully – Deorbited
- DODONA
  - Built & Delivered, No Launch yet

**2020**
- 1st All USC Student Built Satellite – Launch Planned Summer 2020
- MAGNETO
  - COTS Sensors measure magnetosphere at 1/1000th cost

SERC demos, Some “World firsts” in Nano-satellite class platforms
- Multi-functional structure propulsion system w/NGST
- Largest (~.5m) antenna deployable
- High performance embedded computing (HPEC)
USC’s Nano/Small Satellite capability goes from design, simulation, to build and fly...
MAGNETO

• Primary: Use low cost COTS sensors to measure the Earth’s Magnetic Field in Low Earth Orbit (LEO)
  – Compare results to more expensive ESA Swarm satellites to show smaller and cheaper doesn’t mean inaccurate

• Secondary: Use Ephemeris, Sun Sensor, and gyro’s to estimate pose/position in orbit

• Tertiary: Update to higher accuracy ephemerides through TCA accesses from global amateur radio community
1.5U Cubesat
DODONA/LA JUMENT

- 3U Cubesat
- Payload is from LMCO
- Bus Built in MdR, provide power, attitude control, and telemetry for Payload
- Launches in Feb 2021, must be delivered End of Nov 2020!!!!
Dodona OV-1

**Launch**
- Dedicated SmallSat Launcher

**Mission Control**
- Command & Control
- Mission Operations

**USC Ground Station**
- UHF, VHF & S-Band

**Mission Operations**
- Health & Status Beacons
- Operate Payload Cards
- Downlink to UHF Ground Station

**UHF**

**End of Life**
- Planned 6mo ops

**Descent**
- Custom solution, Vector proprietary

- Solar Panel Deployment
  - 30 min after ejection (?)

- Cubesat Despin
  - 1-2hr from panel deployment
  - Despin with torque rods only

- Sun Point
  - Recharge Batteries

**VPN**
PHAROS

- 2 6U Cubesats
- Tandem Flight, launched together
- Each tests different payload technology, linked via optical communications
- Built in MdR, launched in late Summer 2021!!!
Satellite Tracking (PL = Claire Carlton)

4.5m Dish (L-C band) 5m Yagii (UHF/VHF)

Ground Control Station for simultaneous Ops
LEAPFROG (Lunar Entry and Approach Platform For Research On Ground) was started as a multi-semester design-to-flight student hands-on training activity through the Astronautics and Space Technology Division and Information Sciences Institute at the University of Southern California in 2006.

- **Mass** = ~ 23 kg
- **T/W** = ~ 1.05 (w/o Payload)
- **Flight Time** = Less than 1 min.
- **Payload Capacity** = ~ 0.1 kg
- **Engine** = JetCat P200
- **Thrust** = ~ 230N
Original LEAPFROG Architecture was meant to support Step-Wise Research

<table>
<thead>
<tr>
<th>Gen-0, Proof of Concept</th>
<th>Gen-1, Prototype Testbed</th>
<th>Gen-II, Prototype Testbed</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Proof of Concept Flight Vehicle</td>
<td>• Payload Capacity = 0.5 to 2 kg</td>
<td>• Payload Capacity = 10 kg</td>
</tr>
<tr>
<td>• Flight Time = 3-5 Minutes</td>
<td>• Core Hover/Flight Avionics</td>
<td>• Extended lander’s functionality</td>
</tr>
<tr>
<td>• Payload Capacity = 0.5 kg</td>
<td>• Aerospace COTS Components</td>
<td>• Ingenious thrust vector control combining Gimbal and cold-gas systems</td>
</tr>
<tr>
<td>• Core Hover/Flight Avionics</td>
<td>• Basic Pre-Loaded Flight Profile</td>
<td>• Origami-based solar panels</td>
</tr>
<tr>
<td>• COTS Components</td>
<td>• Ability to Respond to Terrain</td>
<td>• Multi-purpose robotic arm</td>
</tr>
<tr>
<td>• Basic Pre-Loaded Flight Profile</td>
<td>• Swap out Core Sensors with New Lunar Landing Sensors</td>
<td>• Advantageous multi-platform design</td>
</tr>
<tr>
<td></td>
<td>• Test out New Landing Systems, Legs, Structures</td>
<td>• Flight Time = 5-6 Minutes</td>
</tr>
<tr>
<td></td>
<td>• Flight Time = 5-10 Minutes</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Terrain Experimentation</td>
<td></td>
</tr>
</tbody>
</table>

• Development Cost/Schedule
  • Component Costs ~ $15k
  • Design to Flight ~ 3 Months

• Prototype Testbed
  • Payload Capacity = 0.5 to 2 kg
  • Core Hover/Flight Avionics
  • Aerospace COTS Components
  • Basic Pre-Loaded Flight Profile
  • Ability to Respond to Terrain
  • Swap out Core Sensors with New Lunar Landing Sensors
  • Test out New Landing Systems, Legs, Structures
  • Flight Time = 5-10 Minutes
  • Terrain Experimentation

• Development Cost/Schedule
  • Component Costs ~ $15k
  • Design to Flight ~ 6 Months

• Prototype Testbed
  • Payload Capacity = 10 kg
  • Extended lander’s functionality
  • Ingenious thrust vector control combining Gimbal and cold-gas systems
  • Origami-based solar panels
  • Multi-purpose robotic arm
  • Advantageous multi-platform design
  • Flight Time = 5-6 Minutes

• Development Cost/Schedule
  • Component Costs ~ $15k
  • Design to Flight ~ 12 Months
Past Flight Tests

Generation 0
USC is part of a NASA Award for a National Stem Challenge!

Introduction

**THEME 3 AWARDS – PILOT ARTEMIS STUDENT CHALLENGES**

- Lunar/Martian Lander skills competition using existing technology to execute the competition in Earth’s gravity and atmosphere
- Develops Artemis-relevant systems engineering and integration skills, and requires innovations to perform well against the other teams
- Requires the development and evolution of critical thinking and hands-on skill sets to enable humankind’s next great steps off of Earth
USC is part of Team (USC PI = Isabel Yarwood)

The Team*

University of California, San Diego
John Kosmatka (PI)
Director, California Space Grant
Department of Mechanical and Aerospace Engineering
Andrew Fletcher (Avionics/hardware)
Garrett Gibo (Avionics/software)
Jose Orozco (Avionics/hardware)
Boruch Allison (Propulsion)

University of Southern California
David Barnhart
Information Sciences Institute
Department of Astronautical Engineering
Michael Smat (Structures)
Debanjana Shrivastava (Engine)
Michael Alexandre (Controls/Gimbal)
Isabel Yarwood Perez (Controls/Gimbal)
Antariksh Narain (Software, Avionics)
Ishan Puranik (Software)
Camden Jones (Software/Controls)
Dan Beilberg (Competition Guidelines)

University of California, Berkeley
Dan Zevin
Space Sciences Laboratory
Public Education Specialist
Shreya Nagpal (Competition Dev)
Bianca Luansing (Competition Dev)
Thanh Tan (Competition Dev)

* 3 universities, 3 faculty leads, and 15 undergraduates
Proposed Flight Competition Operations

**LEAPFROG Operations Center:**
Up to 500 meter range

**Possible Competition Metrics:**
- Flight Time
- Stability and Hold
- Navigation Precision
- Fuel Usage
- Multi-Hop Translation
- Various Guidance Challenges
- Etc

**RC Airfield provides T/O and Landing Sites**

**RC Airplane Pits:** LEAPFROG Fueling and Pre-Flight C/O

**LEAPFROG Sets up PostFlight Assessment and Scoring**

**Competition Field uses RC Fields**

**RC Field supports Audience Member Viewing Stands for public involvement**
Artemis-2 NASA Competition

US National RC Fields identified/info sent on competition

US National Universities/Colleges submit Proposals (Vehicles Built)

Coordinating Universities matched near RC Fields

Competition Teams assigned to Regions
(WebCasts and Training Begins)

Region 1 Competition
Region 2 Competition
Region 3 Competition
Region 4 Competition
Region 5 Competition
Region 6 Competition

RC Field Selection & Matching with Regions

Regional Competitions Held

Final National Competition with winning Teams held
Timeline is not for feint of heart...;)}
Expectations for Fall 2020 Researchers

COVID-19 Restrictions have changed Operations at SERC near term and thus requirements for Researchers

• Graduate Students are PRIORITY
  – Undergraduates are allowed, selected after primary researchers selected

• All new Researchers WILL WORK AT MDR OR CAMPUS
  – Only “remote” work will be with Undergraduates near term

• Grad Students with some level of hands on experience REQUIRED
  – Be familiar with an experimental lab, no time to train on basics
  – MUST FOLLOW NEW COVID-19 PROTOCOLS

• All RESEARCHERS must take the USC General Lab Safety Course (Online)
  – Several projects require additional training in respirators, laser systems operations
Continuation of Expectations for Fall 2020 Researchers

- Minimum commitment requirements
  - 16 hours per week through Fall Semester
  - Prefer commitment can extend through Spring 2021, all projects are multi-year

- ALL NEW RESEARCHERS START AS VOLUNTEERS FOR 30 DAYS
  - After 30 day period down-selects will occur for any paid positions
  - Only volunteers or DRE that can support minimum commitments will be kept on after this time
    - The time and expense to onboard people under the new Covid-Rules is extensive and expensive

- All Projects will have a student “project lead” to help coordinate each project
  - Project leads have higher expected responsibilities

- All Researchers are expected to create a paper or journal article or report
New Operations Requirements for SERC Activities

- **ALL RESEARCHERS MUST TAKE HEALTH TEST ONLINE**
  - There is mandatory training required

- **ALL RESEARCHERS GO THROUGH TROJANCHECK APP**
  - This is REQUIRED minimum 24 hours prior to going to any research facility

- **ALL SERC RESEARCHERS MUST SCHEDULE THEIR VISITS WITH BOOKIT**
  - This is a free online system that SERC uses to manage all researchers in all facilities in all labs

- **MANDATORY PPE REQUIRED**
  - Each lab has minimum set of PPE
  - MASKS ARE REQUIRED IN ALL
  - All Researchers will adhere to the PPE and the Lab protocols. NO EXCEPTIONS
How to Apply and Join

• Interested to Join SERC?
  – Fill out Application at https://www.isi.edu/centers/serc/join_us

• In Application identify
  – NAME OF PROJECT

• DO NOT APPLY IF YOU CANNOT MEET MIN REQUIREMENTS

• The process for selection:
  – Vetting occurs immediately on Monday of each week looking through application database site
  – You will be contacted for a Zoom interview based on your ability to meet min criteria
  – You will be then contacted if selected and provided further input as to how to onboard
  – Onboarding takes at least a week at ISI/SERC, you will be asked to sign up immediately for USC GLS, and be given agreements to sign to support in person research.
  – If you are not contacted immediately, your resume will be kept for possible positions later

• Given the high volume of applicants and tight timelines for projects, there is NO GUARANTEE that if you send an e-mail it will be answered...
POC: Prof. David Barnhart, Director

http://serc.usc.edu
barnhart@isi.edu
310-448-8644

Applications at
https://www.isi.edu/centers/serc/join_us
SERC Growth coupled with Covid-19 Challenges means we need Exceptional Researchers!

• Unique opportunities on advanced and cool projects

• Challenging Schedules and Deliveries on new devices and capabilities for Space

• Experiences that will boost your resume and career potential in future
Locations SERC Alumni have gone onto...

- Northrop Grumman
- Relativity
- Blue Origin
- NovaWurks
- United States Air Force
- Momentus
- NASA
- Motiv Space Systems
- Raytheon
- OffWorld
- Tyvak A Terran Orbital Corporation
“inspirante ad astra...”