

The Epic Challenge Program and the Future of Learning

Student Exhibition & Educator Workshop

NASALangleyResearchCenter
Hampton, Virginia
March 23, 2017



Welcome!

You are cordially invited to participate in an educational workshop we are hosting at NASA's Langley Research Center on March 23rd, 2017. We will be showcasing some of the results of the NASA Epic Challenge Program and the Innovative Conceptual Engineering Design (ICED) methodology which we developed to infuse creativity and innovation into the engineering design process and apply it to conceive solutions to the complex, engineering challenges. Students, educators, and faculty from high schools in Virginia, Massachusetts, New Jersey, and Finland will exhibit their experiences and share their ideas on: pedagogy, curriculum development, learning dynamics, and student assessment. The workshop is open to the public and will be broadcast live for those who cannot attend and wish to participate virtually (<https://dmv.cso.nasa.gov/flex.html?roomdirect.html&key=WST6bna6MQ9I2WpPkFzWwJrN3U>).

Arrival and Badging:

All visitors will arrive at the NASA Langley Badge and Pass Office, Building 1308, at approximately 7:30 AM where you will receive your badge and one-day pass to the day's event. Please make sure you have notified Ms. Tamika Coleman (tamika.coleman@nasa.gov, 757-864-1429) of your intent to attend and provide her with your required information to ensure your badges will be ready for pick up. Closest parking for the workshop is adjacent to building 1195 (see map below). Coffee and refreshments will be provided in the primary meeting room in building 2102 (Rooms Reid I) and the agenda for the workshop is provided below.

Directions and Map of Facilities (NASA LaRC):

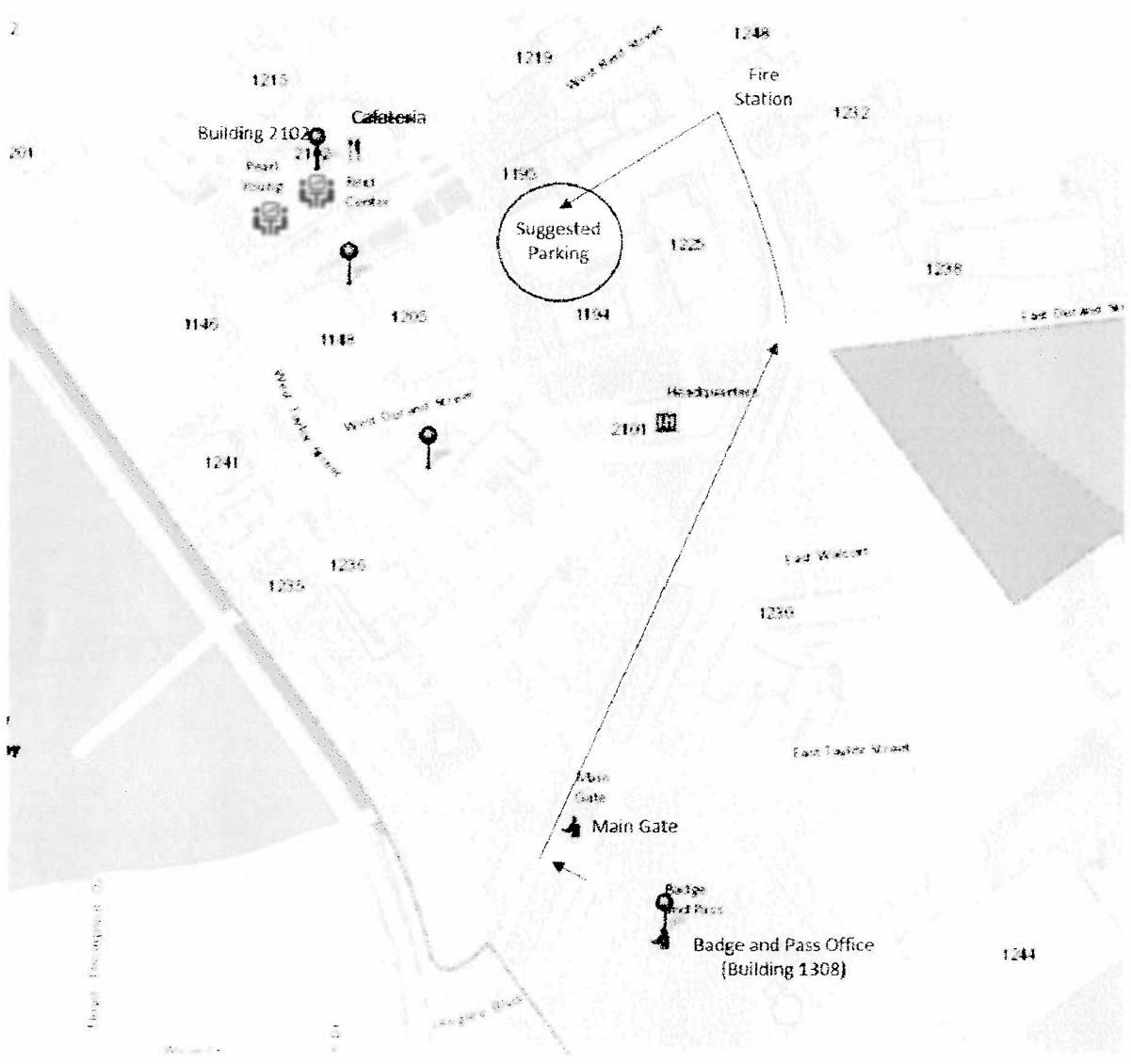
All visitors will arrive at the NASA Langley Badge and Pass Office, Building 1308, at approximately 7:30 AM where you will receive your badge and one-day pass to the day's event.

From Newport News-Williamsburg International Airport

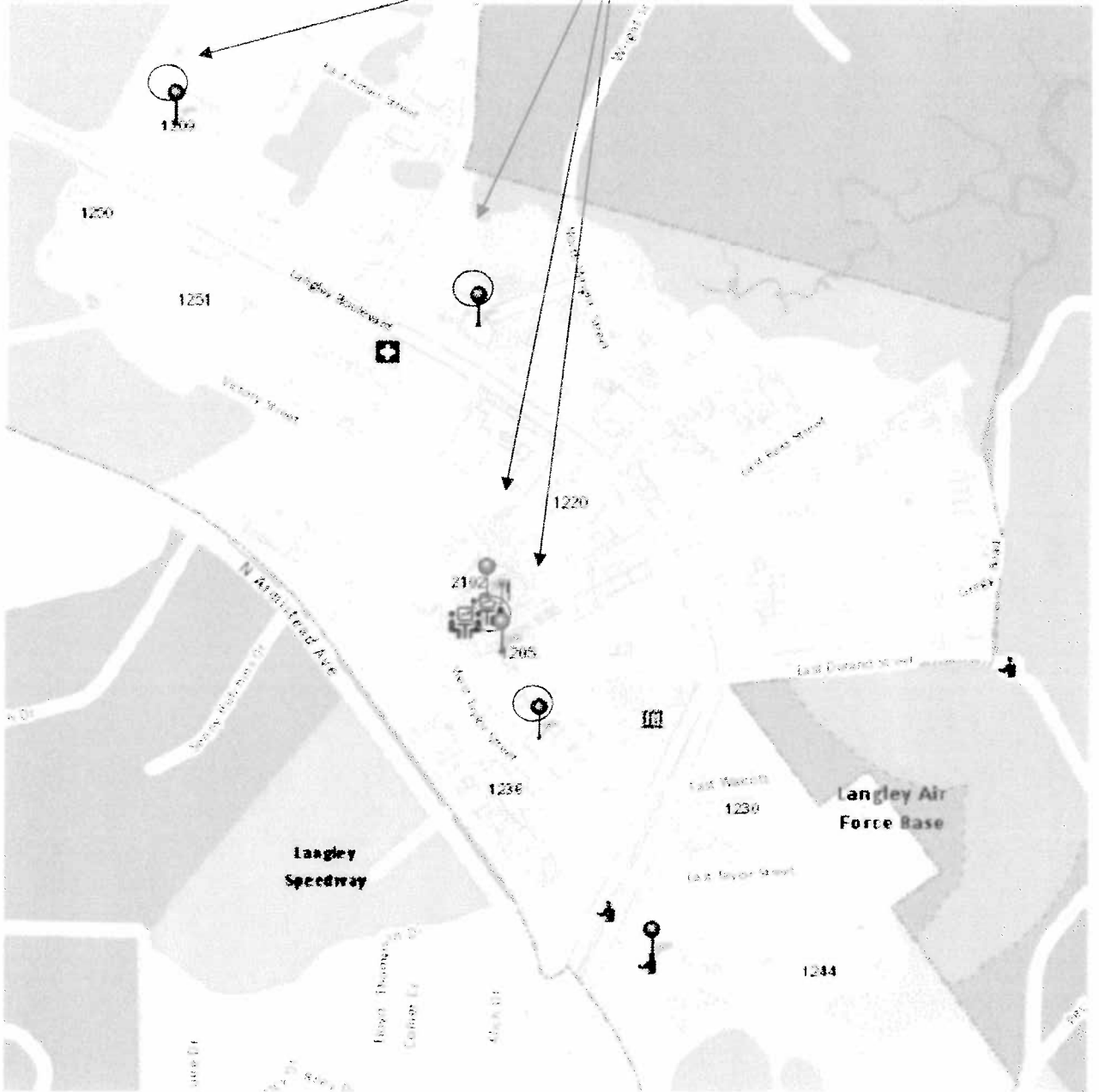
Depart airport toward Bland Blvd
Turn left onto SR-143 East / Jefferson Ave
Take ramp right for I-64 East toward Norfolk / Hampton
At Exit 261B, take ramp right and follow signs for Hampton Roads Center Pkwy
Take ramp right and follow signs for Magruder Blvd / SR-134
Turn left onto SR-134 North / Magruder Blvd
Take ramp right for SR-172 North / Commander Shepard Blvd toward NASA / LAFB
Turn right onto Langley Blvd to LaRC main entrance

From Norfolk International Airport

Depart airport onto Norview Ave
Continue on SR-247 / Norview Ave
Take ramp right for I-64 West / Hampton Roads Beltway toward Richmond / Hampton At Exit 262B, take ramp right for SR-134 North / Magruder Blvd toward Poquoson / NASA
Take ramp right for SR-172 North / Commander Shepard Blvd toward NASA / LAFB
Turn right onto Langley Blvd to LaRC main entrance



Planned Tour



ICED Epic Challenge Program:

Innovative Conceptual Engineering Design (ICED) is a proposed methodology for infusing creative problem solving and innovation within a team-oriented, problem-based learning environment. Implementation of the ICED methodology in this specific program attempts to solve several critical problems facing science, technology, engineering, and math (STEM) education and STEM-related careers in the US such as: the decline in enrollment and achievement in STEM degrees and careers and the early attrition of undergraduate students from STEM programs of study. The ICED program is an integrated approach to teaching basic engineering concepts and problem solving techniques focused on solving real-world, epic challenges facing society. These complex, multidisciplinary challenges provide the inspiration and integrated curriculum for multiple years of study.

The ICED methodology is based on the creation of psychologically-safe virtual and physical environments to solve real-world engineering problems. Throughout this process, students are encouraged to explore, experiment, fail, discover, and learn. It is a program where critical thinking and the questioning of ideas, concepts and even “established” facts and theories is celebrated. The methodology draws upon the teaming of very *diverse* groups of students, engineers, scientists, designers, artists, etc. to explore an open-ended design space and exercise the analytical/logical side of their brain (the left hemisphere) and associated skills as well as the artistic/creative/innovative right hemisphere to conceive and *develop* innovative solutions.

As mentioned earlier, the ICED methodology focuses on the very early “conceptual design” phase of the design process. This allows rules regarding the level of rigor involved in the analysis, design, and test phases of the development cycle to be relaxed in order to intelligently and rapidly conceive, prototype, evaluate and mature as many ideas as possible. This consequently allows for potential failure mechanisms to be identified and addressed early in the design process. The idea for teaching and utilizing this methodology for project-based learning and STEM outreach was inspired by work to identify the cause of the Space Shuttle Columbia accident, and to develop technologies to predict and repair critical damage to the vehicle in the event of a subsequent debris strike prior to landing. Ideas to repair a damaged wing leading edge were rapidly developed and matured using this methodology and flown on the Return-to-Flight Space Shuttle mission following the Columbia tragedy (STS-114) and all subsequent Shuttle missions. Student teams working on one such epic challenge, how to safely land a space capsule on land, successfully analyzed, designed, fabricated and tested a feasible solution which saved considerable mass and significantly increased on-orbit habitable volume. A problem which NASA had been trying to solve for over 50 years!

For more information regarding ICED and the Epic Challenge Program, please see links below:

Link to Epic Challenge Program Video: <https://vimeo.com/110187381>

Link to Epic Challenge Program

Papers: https://drive.google.com/drive/folders/0B84i3cJ_nNa0RnICMFh1YW1rTUE?usp=sharing

Link to Event

Info: https://drive.google.com/folderview?id=0B84i3cJ_nNa0M3JGb0stNDRJR28&usp=sharin

Agenda

The day will begin with a short introduction and brief description and history of the Epic Challenge Program and the ICED methodology. This will be followed by student and educator presentations of this year's program beginning with our newest university and high-school partners from Finland and followed by our partnering university, Virginia Tech and followed by high schools in New Jersey (Bergen Academies and Moorestown HS) and Massachusetts (Northbridge HS). Epic Challenge educators will discuss curriculum design, course content, and student expectations while visiting students will meet a tour guide and walk to several nearby facilities conducting research on space exploration. We will select our lunch in the NASA Cafeteria (B2101) and meet at Noon in a reserved room of the cafeteria (the NACA Room). Following lunch, students will get on a bus and tour several more facilities while educators will continue discussions on education and future plans for next year's Epic Challenge Program and our vision for the future of learning and education.

NASA ICED Epic Challenge Educator Workshop & Student Exhibition
NASA Langley Research Center
March 23rd, 2017

Agenda

- | | |
|-------------|---|
| 8:00 | Welcome and Introduction (Camarda) |
| 8:15 | Brief Discussion of Innovative Conceptual Engineering Design (ICED) Methodology and the Epic Challenge Program (Camarda) |
| 8:30 | ICED Epic Challenge Program Finland (Heikki Immonen)
8:45 Two Teams present |
| 9:15 | ICED Epic Challenge Program USA
9:15 Northbridge HS (MA) – 3 Teams Present
9:45 - 10:00 Break
10:00 Bergen Academy HS (NY) – Student Presentations
10:30 Moorestown HS (NJ) – 4 Teams Present
11:30 Virginia Tech (VA) – One Team Presents |
| Noon | Lunch NASA Cafeteria (Reserved Room) |
| 1:15 – 4:00 | Begin Student Tour of Facilities (Walk to close facilities (B 1148 & 1293) |
| 1:15 – 4:00 | Educator Workshop to discuss curriculum development, pedagogies (Problem-based learning, phenomenon-based learning, etc.) |

Thank you in advance for your consideration and we hope to see you either onsite at NASA LaRC or virtually on March 23rd, 2017.

Dr. Charles Camarda
Senior Advisor for engineering Development
NASA's Langley Research Center
Astronaut STS-114