

May 2, 2016: SPS Internal Layout Competition Press Release

College Students Design Interior of Single Person Spacecraft

College Students Compete for Design of Single-Person Spacecraft Interior

Winners Selected in Competition for the Internal Design of a Single-Person Spacecraft

University students were invited to design the interior of a Single-Person Spacecraft (SPS) and today the winners were announced: The WHISPS Team, including Ondrej Doule, Joseph Torkaman, De Vere – Michael Kiss, Kareim Elbaz, and Azeez Batcha from the Florida Institute of Technology (FIT) School of Human-Centered Design, Innovation, and Art and Brett Montoya & Canaan Martin from the University of Houston (UH) were announced as the winners of the competition today. Brett, a Masters Student in Space Architecture at UH, said, "Despite the fact that the competition focused on the interior, it forced me to consider the craft as a whole; the sum of its parts. In order to map the layout, I had to understand the control requirements for each system. As a result, my understanding of spacecraft systems has grown immensely, and I have Genesis Engineering to thank for that."

Genesis Engineering Solutions (GES) in Lanham, MD sponsored the three month competition as a way to integrate student creativity into the development of their Single-Person Spacecraft. "We didn't know what to expect and now we have an excess of great ideas to choose from." Robert Rashford, GES President & CEO.

The SPS includes an inner pressure vessel for shirtsleeve (normal clothing) operations and an outer unpressurized cylinder for micrometeoroid/orbital debris (MMOD) and impact protection. Subsystems are packaged in the space between and in the overhead crown leaving the interior open for control, displays and other outfitting. An SPS astronaut will have rapid access to the work site to repair the aging International Space Station, or to an asteroid for sample collection.



Figure 1. Single Person Spacecraft Mock Up

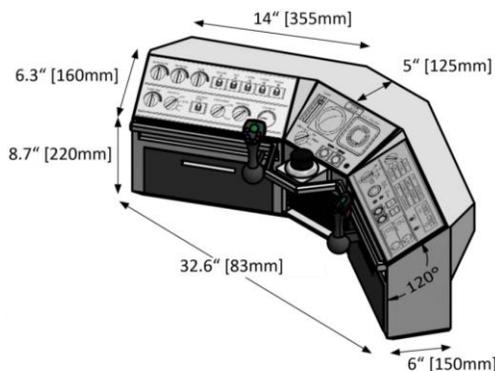
Students from engineering, industrial design, human factors, and space architecture were encouraged to develop creative internal designs using only existing technologies. Furthermore, they had to provide controls for flying the SPS and operating robotic arms all while floating in zero-gravity. The interior had to include displays and controls, warning lights and alarms, pilot restraints, creature comforts, and other accoutrements one might find in a car (if that car was in Low Earth Orbit cruising at 17,000 mph.). Joseph Torkaman from the FIT WHISPS team said, "Our group from the School of Human-Centered Design, Innovation, & Art was fortunate enough to have a team with specialized skills and experience in the domains of commercial aviation, microgravity operations, and aerospace & mechanical engineering design. Our layout design would not have been successful without the multidisciplinary collective of knowledge that made up the WHISPS team."

Two prizes were awarded: a \$ 2500 Grand Prize and one \$1500 Superior Design Prize. The Grand Prize was awarded to The WHISPS Team from FIT whose submission addressed the challenges of working in the extreme environment of space and balanced new unproven technology in space like touch pads with old-school analog knobs reminiscent of the 80's-era Shuttle displays and controls, that according to Joe Fittipaldi, a NASA Human Factors expert and judge is "utilitarian if not altogether elegant". Another NASA Human Factors expert and competition judge, Justin Cartledge said of the WHISPS Team's design, "This design covered accidental touch using button guards and restraining the crew from movement in all 6 directions of freedom, an excellent understanding of the microG environment" and "designed a [air handling] system where airflow mimics the Earth environment, pulling all air (and CO2) towards the feet and providing fresh O2 by the head."

The WHISPS team was excited to win after working "days, nights over midnights and weekends on this competition with great motivation." Their team leader, Professor Ondrej Doule said of their design approach, "We spent more than 60% of our design time performing functions analyses to understand real need of astronaut putting forth human-system integration and Human-Centered Design methodologies and we are really happy that it was worthy!"



TOP VIEW
SCALE 1:20



ISOMETRIC DASHBOARD VIEW
SCALE 1:10



Figure 2. WHISPS Team Proposal Snapshot & Usability Testing using Full Scale Mock Up in Action

The Superior Design prize was awarded to Brett Montoya from University of Houston (UH) for their unique design solution and by paying “careful attention to ensuring a common viewpoint across the anthropometric scale. Further, the designer clearly strove to preserve virtually 100% of direct LOS through the clear canopy,” according to NASA Human Factors expert and judge, Joe Fittipaldi.

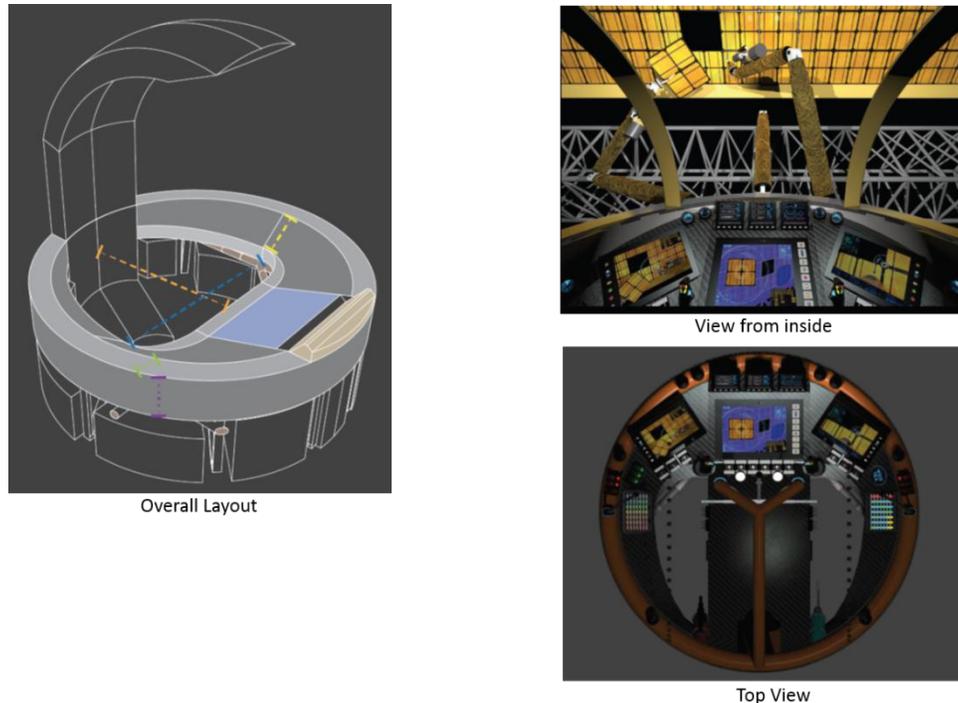


Figure 3. University of Houston Team Proposal Snapshot

The winners of the SPS internal design competition were selected by a panel of experienced space experts. In addition to GES personnel, jurors included a former NASA Astronaut, NASA human factors engineers, and specialists in robotics:

Robert Rashford, Genesis President & CEO

Brand Griffin, Genesis SPS Program Manager and former NASA engineer supporting human Mars mission planning and the design of deep space habitats. Over his career he worked with Boeing serving as the Habitat Module manager for Space Station and the manager for piloted planetary rovers. Mr. Griffin participated in the first space station neutral buoyancy test and his version of an advanced space suit was on display for 10 years in the Smithsonian National Air and Space Museum.

Mike Miller, Genesis SPS Chief Engineer

Josh Lutter, Genesis SPS Mechanical Design Lead

Joe Hale, NASA Human Factors Expert at Marshall Space Flight Center (MSFC) in Huntsville, Alabama for over 32 years.

Dr. Thomas Low, Associate Director of Robotics at SRI International where, since 1984, he has led research programs in telerobotics and autonomous systems. His work has been instrumental in the development of the first generation da Vinci surgical robot, among others.

Paul Richards, Former NASA Astronaut & Current Project Manager of the NASA Laser Communications Relay Demonstration Mission.

Justin Cartledge, NASA Human Factors Expert and a Payload Communications Manager (PAYCOM) in the Payload Operations Integration Center (POIC) in Huntsville, Alabama for the International Space Station (ISS).

Thomas Hagale, Boeing Human Factors Expert

Joe Fittipaldi, NASA Human Factors Expert currently supporting the NASA International Space Station Payload Operations Integration Function (POIF) with industry experience at Boeing, including flight crew station workload analysis and ergonomic evaluations of the layout of passenger accommodations for the Boeing Air Force One 747 Presidential Aircraft Replacement Program.

Genesis Engineering Solutions is located in Lanham, MD and has supported NASA projects since 1993, including the Hubble Servicing Missions and the James Webb Space Telescope. For more information about the competition, Genesis, the SPS, winners, or judges please contact ewolf@genesisesi.com.