

Aerospace Institute at the Houston Spaceport PDDM

AEROSPACE INSTITUTE PROJECT DEFINITION MANUAL Commissioned for the Houston Airport System



AUGUST 15, 2022

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TABLE OF CONTENTS

1. INTRODUCTION	
Executive Summary	3
Genesis	4
Organizational Structure	7
2. VISION: HOUSTON AIRPORT SYSTEM	
Aerospace Institute at Houston Spaceport	11
3. VISION : ACADEMIC PARTNERS	
San Jacinto College	13
University of Houston - Clear Lake	14
Texas Southern University	15
Rice University	16
4. VISION : AEROSPACE INDUSTRY	
Axiom Space	17
Collins Aerospace	18
Intuitive Machines	19
5. PROGRAM	
Laboratories	23
Classrooms	39
Support Spaces	48
Program Table	50
6. DESIGN CONCEPT	
Concept	53
Master Planning	54
Building Design	60
7. BUILDING APPROACH	
Code Approach	69
Estimate Budget	70
Sustainability	71
Constructability	73
Structural Narrative	74
Landscape Narrative	76
8. TSU ACADEMY OF AVIATION & ADVANCED TECHNOLOGY	
Design Concept	79
Program	80
Building Design	82
9. APPENDIX	
Design Drawings	86
Meeting Minutes	100
10. CONCLUSION	
Summary	154

INTRODUCTION

EXECUTIVE SUMMARY



The document that is commissioned here and will unfold in the following pages will serve as a Project Definition Manual (PDM) for the Aerospace Institute at The Houston Spaceport. The main goal of this PDM is to define a path for the creation of the Aerospace Institute in Houston, Texas. To help define a single path, it is important to 'consolidate a master plan' with a Singular Vision of all of the partner institutions, which will then lead us to the next steps of execution. This PDM Document achieves exactly that purpose.

The first and most important steps that were taken to initiate this effort was to align the visions of the partner institutions. Visioning sessions were conducted with the Houston Airport System leadership team, the Houston Spaceport Board, leaderships of San Jacinto Community College, University of Houston Clear Lake, Rice University, Texas Southern University, and Space Industry Partners such as the Axiom Space leader, Collins Aerospace team and the Intuitive Machines team. The response was consistently in favor of an Aerospace Institute located right in the center at the Spaceport Campus of the Ellington Field Airport in Houston, Texas. This was the first time that such a comprehensive effort has been conducted to meet with so many academic and industry institutions and get their feedback for viability and the need for an aerospace training institute. The results have shown a great need and a unanimous support for a Spaceport HUB to not just serve as an aerospace training center, but also to serve as a central place for Space Industry Collaboration, Demonstration and an Industry events venue.

This PDM Document, although commissioned by the Houston Airport System, is truely a widely collaborative effort between the Houston Spaceport, all of the Academic Institution partners who were extremely involved with their time and commitment, and all the Space Industry partners who have brought very valuable commercial perspectives to this effort without which this plan would be remiss and incomplete.

Once the visions were aligned and there was a wide ranging consensus, we proceeded to the next steps of understanding the workforce training needs of the Industry and the corresponding facility needs of the Academic partners. These needs were aligned with the Vision of the Houston Airport System to create an Aerospace Training Hub building program.

So the PDM begins with the genesis of "Why" the Aerospace Training Institute is important, and then captures the Vision Statements of the various partners; after which extensive 'Needs Analysis' meetings and design charrettes were conducted with all the academic and industry partners. The data was captured and analysed. Based on that data, a programming document was prepared to forecast the facility requirements for the initial Training Center Hub Building. It shows the future modular phasing and the eventual Aerospace Institute Campus Expansion. Details the research conducted of the various existing training centers and their analysis were also incorporated in the programming and planning efforts.

The facility programming and forecasting paved the way for the creation of a concept for the physical facilities for the Aerospace Institute, a conceptual master plan, and space plans for the Initial Hub building.

Sincerely,

Sabir, F AIA, NCARB, LEED AP Principal In Charge GENESIS



Over twenty participants competed to facilitate Blue Origin's next manufacturing facility. Blue Origin was looking for the right location, workforce availability, and infrastructure to house their Rocket Engine company. This facility would primarily manufacture the new BE-3 - and larger - BE-4 Engines for their New Glenn Rocket and Vulcan respectively. This was a great opportunity for the Houston Spaceport to bring a great deal of investment as well as over 350 well-paying jobs. Houston's San Jacinto College was preparing to re-structure their job-training programs for the petrochemical and aerospace industries. This would include classes that taught welding, robotics, and other practical knowledge and training required by Blue Origin's workforce positions. However, in June, 2017, Blue Origin announced that their new facility would be awarded to Huntsville, Alabama, which already had a strong workforce present. The Houston Spaceport lost by one vote.

One of the missing links to harboring Blue Origin's next rocket engine factory was a sustained aerospace workforce and infrastructure at the Houston Spaceport. A key attribute would be a center for higher learning, education, and workforce training that directly caters to aerospace industries. This Aerospace Institute will become the training center for aerospace and aviation to develop a specialized workforce and leadership required by the ever evolving aerospace industries. In February 2019, a feasibility study performed by MGT Consulting Group concluded that the Aerospace Institute would not only be highly feasible, but also highly beneficial to the future of Houston Spaceport.

WORKFORCE POTENTIAL

Houston has had long history in terms of aerospace and facilitating the needs of space industries. However, its increasing population present an undeniable opportunity to increase and improve its labor force. Houston's current population is projected to increase by 5.4 percent by the year 2025. Moreover, it is predicted the population age between 15-24 and 25-34 will increase by 7 percent. There is a great opportunity to promote post-secondary education and workforce training as there is 50 percent of the population that have some college credit or highschool diploma. Many Houstonians might benefit from furthering their education. The demographics and economy of Houston and Texas present a favorable opportunity for the Houston Spaceport to support aerospace and related industries, particularly given the city's growing and diversifying population, educational attainment, increased workforce, and opportunities for continuing education.

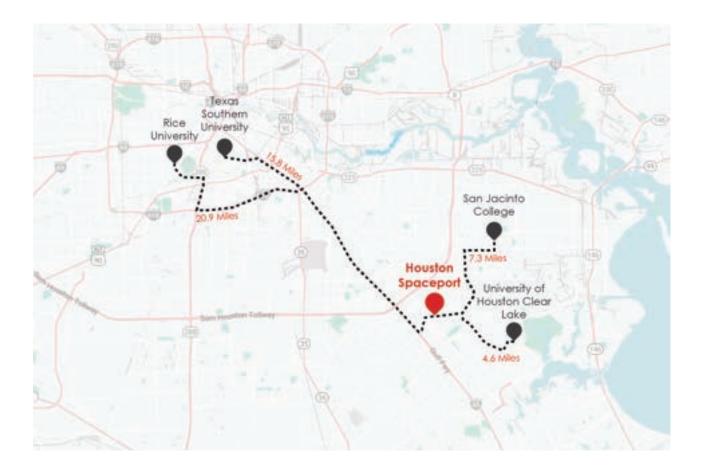
Moreover, available jobs within the Houston have increased from 3.2 million to 3.4 million with the an average-to-above job posting intensity growing. This means the employers are fervently looking for positions to be filled. Some of these positions include aerospace engineering technicians, composite technicians, electrical assembly technicians, and mechatronics technicians. All stated positions have listed competitive salaries when compared to the minimal education required to work in aerospace industries.

LOCATION

The Houston Spaceport, the tenth of twelve already sanctioned commercial spaceports, is advantageously located at Ellington Field. It has access by air, sea, land, and train, and it is strategically placed inside a large metropolitan area with proximity to universities, colleges, and the NASA Johnson Space Center.

EDUCATIONAL PROXIMITY

Currently, seven of the twelve FAA Licensed Spaceport Sites do not have local higher education institutions that provide certifications or degrees in aerospace, aeronautical, or astronautical engineering. Such programs are available in close proximity to Houston Spaceport. These programs are presently offered by the institutions, and students have graduated from them. Furthermore, there are several initiatives that encourage the expansion of aerospace-related fields.



Higher Education Institution	Engineering Technologies/Technicians and Engineering-Related Fields CIP 15.04, 15.06, 15.07, and 15.08				Aerospace, Aeronautical and Astronautical Engineering CIP 14.02					
	Certificate	Associate	Bachelor	Master's	Doctorate	Certificate	Associate	Bachelor	Master's	Doctorate
Brazosport College	✓	✓								
Houston Community College	~	\checkmark								
Lee College	✓	✓								
Lone Star College	✓	\checkmark								
Ocean Corporation	✓									
Remington College- Houston Southeast Campus		~								
Rice University									✓	
San Jacinto	✓	\checkmark								
Texas Southern University			~							
University of Houston			✓						✓	
University of Houston- Downtown			✓							

Source: Emsi Q4 2020 Data Set.

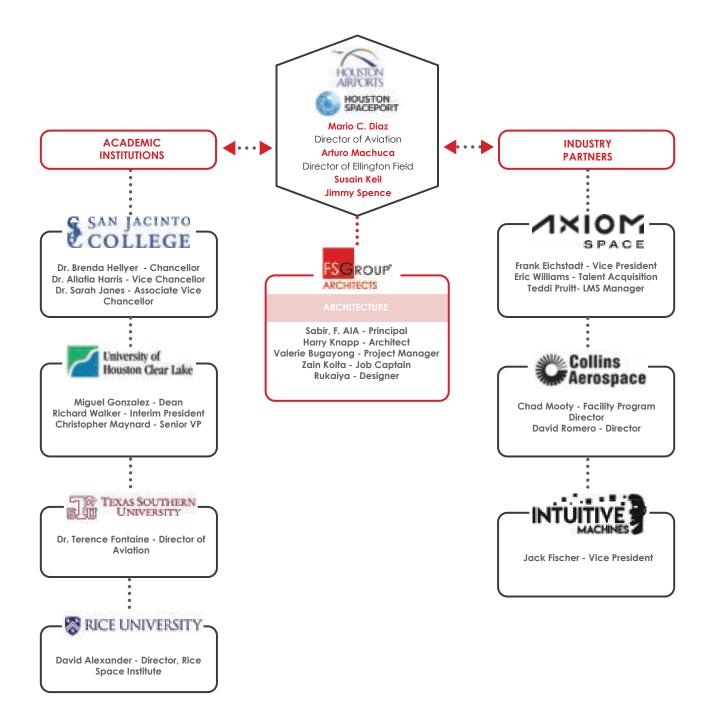
MEMORANDUM OF UNDERSTANDING

Because of strong academic and industry support, a Memorandum of Understanding has been agreed upon by respective academic consortium members. This MOU describes a three phase approach that will promote the Houston Spaceport as a global leader and innovative pioneer in providing a talented workforce for space, aerospace, and aviation companies.

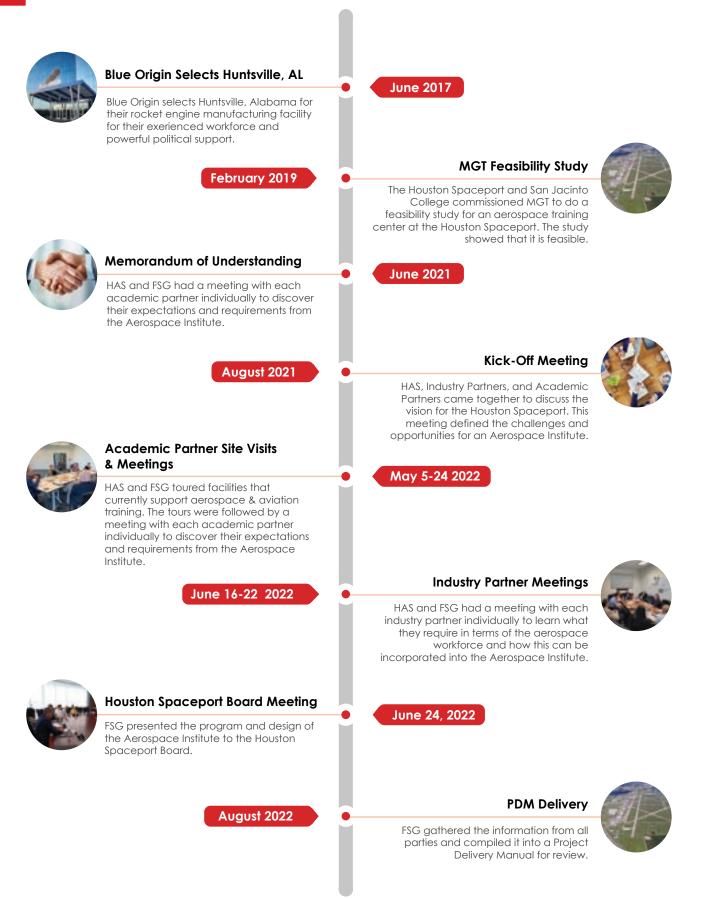
The first phase elevates the efforts of San Jacinto College in preparing and training workforce for local aviation and aerospace employers. This will, in turn, attract other industries and grow the Houston Spaceport. The second expands leadership by offering advanced degrees to a competitive workforce. This will lead to the last phase which will focus on creating knowledge and solving industry- based challenges.

During this time, consortium members agree to participate in Aerospace Institute planning and coordination as well as offer training, education, and research opportunities for industry. They shall collaborate with other team members and industry to develop programs and instructional support and, provide expertise and advice to the Aerospace Institute and HAS as facilities are developed and curriculum implemented.

ORGANIZATIONAL STRUCTURE



TIMELINE



KEY PERSONNEL



~

Houston Airport System Mario C. Diaz Director of Aviation
Houston Airport System Arturo Machuca Director at Ellington Field and Houston Spaceport
Houston Airport System Susan Keil Design Manager/ PM Senior Architect at HAS
Houston Airport System





University of Houston Clear Lake Dr. Richard Walker Interim President

University of Houston Clear Lake Dr. Christopher Maynard Senior Vice President

San Jacinto College Dr. Brenda Hellyer Chancellor

San Jacinto College Dr. Allatia Harris Vice Chancellor

San Jacinto College Dr. Sarah Janes Associate Vice Chancellor

Texas Southern University Dr. Terence Fontaine Director of Aviation

Rice University Dr. David Alexander Director, Rice Space Institute

Axiom Space Frank Eichstadt Assembly, Integration & Test Lead

Axiom Space Eric Williams Talent Acquisition

Axiom Space Teddi Pruitt LMS Manager

Collins Aerospace Chad Mooty Facility Program Director

Collins Aerospace David Romero Director, Value Stream Leader

Intuitive Machines Jack Fischer Vice President, Strategic Programs



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1	FS Group Architects Valerie Bugayong, LEED AP Expertise in Project Management and BIM	(713) 344-1752 x 264 valerie@fsdesignbuild.com
-	FS Group Architects Zain Koita Project Designer	(713) 344-1752 x 266 zain@fsdesignbuild.com
0	FS Group Architects	(710) 044 17500/7



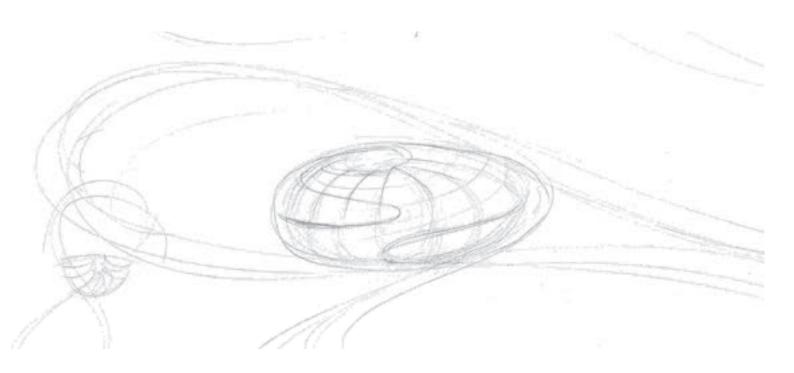
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O2 VISION HOUSTON AIRPORT SYSTEM

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VISION

"A centrally located Aerospace Hub for education, research, and innovation. this hub will be a collaboration center, closely surrounded by space industry & academic partners."



AEROSPACE INSTITUTE AT THE HOUSTON SPACEPORT

Leadership

Director of Aviation Mario Diaz mario.diaz@houstontx.gov

Director of Ellington Feild **Arturo Machuca** Arturo.Machuca@houstontx.gov

Design Manager **Susan Keil** susan.keil@houstontx.gov

Senior Marketing Specialist Jimmy Spence jimmy.spence@houstontx.gov

Airports

- William P. Hobby Airport
- George Bush Intercontinental Airport
- Ellington Field
 (Houston Spaceport)



Under the leadership of Mario Diaz, Director of Aviation, the Houston Airport System has echoed its growth and expansion throughout all of its airports. Currently, it boasts the first North American 5 star Skytrax rated Hobby Airport with George Bush Intercontinental on its way in doing the same. However, the real leap in aerospace comes from Ellington Field's Houston Spaceport. It is one of the twelve spaceports in the country and is the anchor that will attract more vendors to an already strong cohort of industries. The proposed Aerospace Institute will be key in providing specialized staff for future growth. This endevor is spearheaded by Ellington Field's Director, Arturo Machuca.

THE AEROSPACE INSTITUTE

Mario Diaz envisions a central HUB (Aerospace Institute) in the midst of the aerospace industry buildings to provide facilities for aerospace workforce training as well as becoming a location for industry & government collaboration. In addition, developing a highly trained workforce will also be a place for aerospace education, research, and innovation and collaboration. This will define the efficient upward spiral of education, internships, higher specialized training to a higher specialized job that requires a constant workforce evolution.

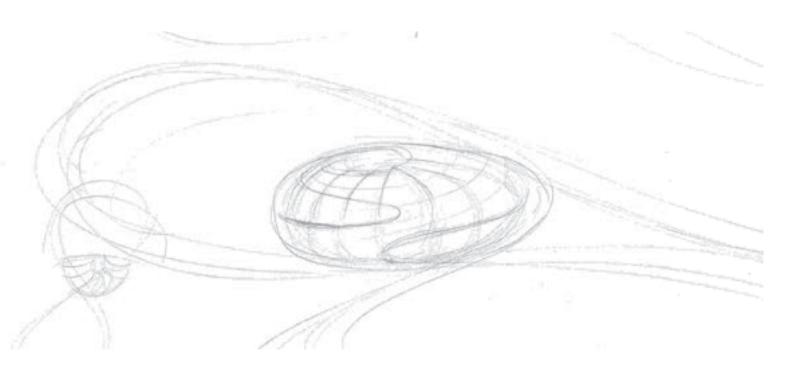
Moreover, the goal is to look towards the potential of including new educational partners, new aerospace companies, governmental institutions, and to develop a workforce training program to facilitate the aerospace industry. The Aerospace Institute's ability in streamlining academic-industry collaboration shall be vital in garnering the interest of new aerospace companies, which will lead to the growth and expansion of the Houston Spaceport. These endevors will culminate in **Houston becoming Space City again**.

03 VISION ACADEMIC PARTNERS

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VISION

"A place where all institutions can co-exist and have the same MISSION when it comes to Aerospace training, education, and research."



03

VISION : SAN JACINTO COLLEGE

Location

8060 Spencer Hwy. Pasadena, TX 77505

Contact

Chancellor. Dr. Brenda Hellyer brenda.hellyer@sjcd.edu

Associate Vice Chancellor. **Dr. Sarah Janes** sarah.janes@sjcd.edu

Degrees offered

Ceritificate Associates

Programs offered

- Aerospace Core Course
- Advanced
 Manufacturing and
 Automation skills
- Aerospace Composite Manufacturing Technician
- Aerospace Electrical / Electronics Technician
- Aerospace Quality
 Technician
- Aerospace Structures
 Technician
- Drone Pilot

SAN JACINTO COLLEGE



MISSION

To promote innovative Aerospace/STEM education, workforce training, resources and opportunities through collaborative partnerships.

ABOUT

San Jacinto College has had a long history in training and certificate programs that help build the foundation of workforce and labor in the petroleum and aerospace industry. The Edge Center has been the official education partner for the Houston Spaceport and offers multiple ways to upgrade workforce skill level. Since its inception, the Aerospace program at San Jacinto College has developed close ties with industry partners serving the Texas region with over 5,500 employees from 60 companies.

The stairways and landing method has been adopted as an effective way of ongoing **continued education** at San Jacinto College. These are additional certificates or degrees that allow an individual to develop their skills to advance to the next level of their career. This method consistently provides a proficient workforce to industry.

Their Aerospace education and work force goals are to increase STEM career awareness and assist in educational needs. This would in turn bridge the gap between education and industry. This is done by the way of scholarships, scholars programs at NASA and internships.

Due to Houston and San Jacinto College not gaining favor of Blue Origin and its future rocket manufacturing facility, San Jacinto College worked with Baytech which brought together academia, industry, NASA, and the State of Texas to establish an interest for a future aerospace institute.

VISION : UNIVERSITY OF HOUSTON CLEAR LAKE

Location

2700 Bay Area Blvd, Houston, TX 77058

Contact

Senior Vice President of Academic Affairs and provost of University of Houston Clear Lake. **Dr. Christopher Maynard** maynard@uhcl.edu

Degrees offered

Bachelors Masters

Programs offered

- BS in Mechanical
 Engineering
- BS in Physics
- BS in Computer Engineering
- Chemical Engineering
 Specialization
- Civil Engineering Specialization
- Electrical Engineering Specialization
- Industrial Engineering Specialization
- MS in Computer
 Engineering
- MS in Physics



MISSION

Provide a HUB for onboarding, internships, and spaces for academic and industry collaboration while allowing multiple entry points to learn new skills.

ABOUT

The University of Houston Clear Lake is looking to expand its programs and courses for the future Aerospace Institute as it is one of the closest geographical academic partners of the Spaceport. The university would like its students to have a more hands-on experience with industry partners though onboarding and internships. The university currently serves 9,400 students with 20 percent of them participating in internships.

With industry partners being in close proximity, UHCL has expressed a profound interest for an exhibition space where cutting edge technology can be displayed by both academic and industry. This will not only garner the interest of the current workforce through demonstrations and collaborations, but also generate an interest of K-12 students through summer camps and other events.

Along with a strong affiliation with San Jacinto College, The University of Houston Clear Lake shares a strong desire to provide composite certifications where students can obtain a Bachelors or Masters degree after completing their associates or certifications from San Jacinto College. Currently, they are partnered on a \$1M grant to explore shared opportunities in continued education.

University of Houston Clear Lake

VISION : TEXAS SOUTHERN UNIVERSITY

Location

3100 Cleburne St, Houston, TX 77004

Contact

Director of Aviation. Dr Terrence Fontaine terence.fontaine@tsu.edu

Degrees offered

Bachelors Masters

Programs offered

- B.S in Aviation Science Management
- B.S in Aviation Science Management, Professional Pilot Concentration
- B.S in Maritime Transportation Management and Security
- B.S in Electronics
 Engineering Technology
- Aerospace Electrical /
 Electronics Technician
- M.S in Transportation
 Planning and
 Management



MISSION

To train new highly selective talent that will fulfill the need in the Aviation Industry. Despite the difference of being below or above the 68,000 feet level which separates Aviation and Aerospace, the ground level requirements of having talented management, operators and pilots will be needed for the development of the aerospace industry.

ABOUT

Texas Southern University is one of the nine Historically Black Colleges and Universities(HBCU) in the country to have an aviation management program, a pilot program, and flight school, and the only one in Texas to have them at one location. Currently with an enrollment of 60 students for the Aviation Management program and 20 students for the Pilot program, Dr. Fontaine envisions that there will be a steady growth for the Pilot program.

In Fall 2022, TSU will be creating a new 4-year UAV Drone program which will also fall under the umbrella of the Department of Aviation. The current Management program is closely affiliated to IAH, Hobby Airport, and Ellington Field where many of the new airport personnel have come from the TSU Aviation Management program.

The current Pilot program has had partnerships with the Air Force, United Airlines, Southwest Airlines, regional airlines, HISD Sterling Aviation High School, and the ROTC program.



VISION : RICE UNIVERSITY

Location

6100 Main St, Houston, TX 77005

Contact

Director, Rice Space Institute **Dr. David Alexander** dalex@rice.edu

Degrees offered

Masters

Programs offered

- Master in Mechanical Engineering
- Professional Science
 Masters



MISSION

To establish the Rice Space Institute as a world leader in space science research and space technology development by fostering interdisciplinary research and education in collaboration with academic, business, industry and government partners.

ABOUT

Rice Space Institute's goals are to create multidisciplinary research programs while promoting stronger research and education ties with industry and academic partners. They would like to have more space related activities and engage the broader Houston community in promoting and engaging in space related research and education.

NASA, Divlnc, and The Ion have been awarded a \$1.4 million in federal funding to create an Aerospace Innovation Hub. Rice University has partnered with NASA and The Ion to help develop and grow minority entrepreneurs and promote innovative solutions in Houston. They hope to catalyze economic growth and move towards the commercialization of space. This Hub will facilitate NASA's expertise and resources in robotics, medicine, health support systems, and additive manufacturing. It shall also have spaces where community events and training can be held.

Rice Space Institute has also signed an MOU with the General Consulate of Canada in Dallas to collaborate on space science and technology. This agreement presents a new pathway for potential interactions between the Canadian science industry and commercial entities.

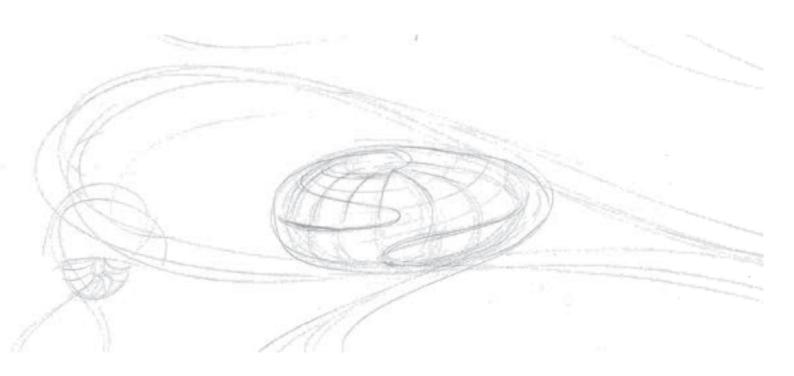
04 VISION AEROSPACE INDUSTRY

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VISION

"Make Houston 'Space City' Again"

"A collectively accessible toolbox for innovation, research, and collaboration."



VISION : AXIOM SPACE

Location

510 Ellington Field, Houston, TX 77034

Contact

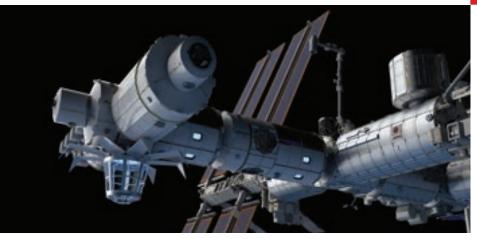
Assembly Integration and Test Lead Frank Eichstadt franke@axiomspace.com

LMS Manager **Teddi Pruitt** teddi@axiomspace.com

Projects

- Next Generation
 Spacesuits contract
 with NASA
- Ax 1 Mission, All private astronaut mission to the ISS
- Axiom Hab One-Crew, Research and Manufacturing
- Research in 3D
 Bioprinting
- Research in Alloys and
 Super-alloys
- Research in Protein
 Crystallization





MISSION

Access to human capital - a blue sky approach that leads to optimization, providing a collectively accessible toolbox.

ABOUT

Axiom Space is interested in the Aerospace Institute as a collaborative HUB. Professional engineers can visit, test robotics, mechanics and machinery at the Aerospace Institute for a lower investment in creating a product. The methodology is - **start with optimization and end with a viable product**.

The goal is not just about acquiring talent, but talent that has been trained and continues to be trained and specialized over time. Axiom Space would prefer that their interns dedicate time every week towards professional development. Axiom Space would like to create quality data through testing and skill-based training. Their primary focus is on avionics accurate technical communication, and DFX (design for excellence) to measure the quality of a solution.

Exhibition spaces are also of key interest. However, these are not limited to large multi-purpose areas, but also the laboratories as well. While promoting an industry-academia collaboration, it also introduces technology that is not well known to the community.

Currently, Axiom Space would like to create a skill set for Test Engineering, Composites Fabrication and Composites Inspection. They have 24 summer interns, and will have 500 new hires out of which 200 shall be entry level positions. They aim to hire close to 1000 new employees every year in the near future.

VISION : COLLINS AEROSPACE

Location

2555 Atlantis Shuttle St. Houston, TX 77059

Contact

Facility Program Manager Chad Mooty Chad.Mooty@collins.com

Projects

- Next Generation
 Spacesuits contract with
 NASA
- Environmental Control and Life Support Systems (ECLSS)
- Optical Expertise
- Space Sensors
- Space wheels



MISSION

To hire specialized talent and also understand the community responsibility as a core value.

ABOUT

Collins Aerospace sees the Aerospace Institute beneficial in 2 significant ways. The future Artificial Intelligence program at the Aerospace Institute shall provide the talent they need in close proximity, especially with AR and VR being so prevalent in today's technology. The second, is to continuously grow their team members' capabilities.

With the possibility of Raytheon's Research center relocating to Houston, Collins Aerospace may require additional workforce as well as space for small business incubator opportunities and partnerships.

Collins Aerospace requires 40 to 50 certifications that their employees would need to renew and update every 2 years. Collins Aerospace approaches training through an "Agile" approach that promotes learning, allowing team members to fail to get it right. They see value in shared space and machinery with students and understand the current trend of 3D printing with specialized equipment. They also constantly try to expose students to industry speakers to generate more interest in aerospace.

There are 7 to 10 interns at present with 30 percent of new hires being students. Collins Aerospace is also in the final stages of an agreement with Boeing for internships with hands-on experience. They are also doing a number of MOU agreements and working with academic institutions to attain the right experience targeted with specific industry partners.



VISION : INTUITIVE MACHINES

Location

13467 Columbia Shuttle St. Houston, TX 77059

Contact

Vice President Jack Fischer jfscher@intuitivemachines.com



MISSION

To make Houston "Space City" again through specialized Infrastructure and workforce.

ABOUT

Intuitive Machines stated that a shared infrastructure (equipment and machinery) would be beneficial to industry and the Aerospace Institute itself. It is important to have an operational working system up and running early. Smaller companies need to get moving quickly and cheaply. Taking over empty nearby commercial retail space might be helpful for start-ups.

With the Houston Spaceport still being in its infancy, Intuitive Machines believes that the Aerospace Institute can be the anchor, the attractive angle for other vendors and/or space companies to move into and near the Spaceport. These companies can then attribute to infrastructure needs such as 3D printers, thermal vac chamber, shake table, and big skiffs.

In terms of employee skills and skill level, Intuitive Machines would like to have composite technicians, avionics, electricians, life support (ECLSS), chemical engineers, and specialized internships. The current EDGE center model is exactly what Intuitive Machines requires since it fulfils industry needs with regards to workforce training.

There are 10 to 12 student hires present at Intuitive Machines, with a current employee count of 170, and a projected growth of 300 over the next 2 years. As Intuitive Machines bids large contracts at the Johnson Space Center, having the right infrastructure and a talented workforce provided by the Aerospace Institute shall prove more significant than ever before.



04

05 AEROSPACE INSTITUTE PROGRAM



SMALL LABORATORIES

Small laboratories are multi-purpose, shared spaces that can be customized for future use. These laboratories will include common utilities to service specific trades such as AR/VR, testing/computer, and soft goods (sewing). These spaces will eventually be customized based on user, trade, or industry partner needs.

These spaces shall have:

PROPERTIES

- Square footage range between 600 square feet to 1000 square feet.
- Standard ceiling height open to structure or lay-in ceiling system.
- Incorporate sealed concrete floors and/or carpet.
- Widened doors along corridor.

These spaces will include at room entrance:

SAFETY

- Emergency shower station.
- Emergency eye wash station.
- Hand wash area and sanitizer.
- First aid station.
- Cleaning station with eye protection and earplug dispensers.
- Emergency utility shut-off switches.

These spaces will include main line utility infrastructure running through the room.

UTILITIES

- Have their own individual electrical sub-panels with overhead / floor-mounted electrical
- access.
- Have hot and cold water supply.
- Have natural gas supply.
- Have compressed air supply.
- Have HVAC with high exhaust capability and enhanced accessible air filtration systems.
- Incorporate floor drains throughout the space.
- Integrate with the HUB's comm/data backbone for maximum information flow.
- Have specialized wastewater collection.
- Have chemical/vacuum traps and waste chemical disposal systems.
- Vertical chase for future specialized exhaust through roof.

SMALL LABORATORIES



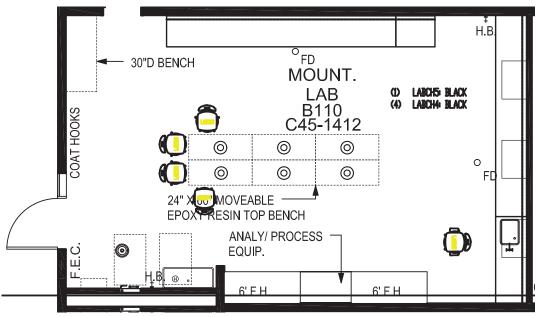
University of Houston Clear Lake Teaching Lab



University of Houston Clear Lake Instrument Lab



San Jacinto College CPET Metallurgy Lab



TECHNOLOGY LAB REFERENCES



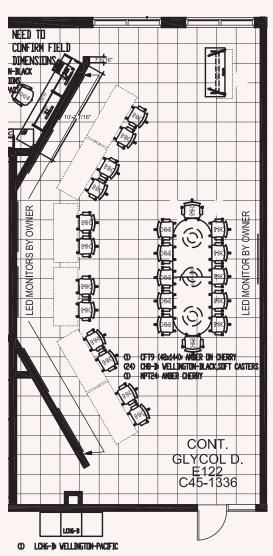
Texas Southern University Virtual Airport Lab



WSU Tech Instructional Computer Lab



University of Houston Clear Lake Computer Lab





San Jacinto College CPET Control Glycol Lab



MEDIUM LABORATORIES

Medium laboratories are multi-purpose, shared spaces that can be customized for future use. These laboratories will include common utilities to service specific trades such as fabrication, NIDA electronics, painting/coatings, 3D printing, composites, and material handling. These spaces will eventually be customized based on user, trade, or industry partner needs.

PROPERTIES

These spaces shall have:

- Square footage range between 1500 square feet to 2000 square feet.
- Standard ceiling height open to structure
- Incorporate sealed concrete floors and/or carpet.
- Have exterior access for loading/unloading and/or exterior testing and use and/or widened doors along corridor.

These spaces will include at room entrance:

SAFETY

- Emergency shower station.
- Emergency eye wash station.
- Hand wash area and sanitizer.
- First aid station.
- Cleaning station with eye protection and earplug dispensers.
- Emergency utility shut-off switches.

These spaces shall be customizable to accommodate areas large enough for:

FLEXIBILITY

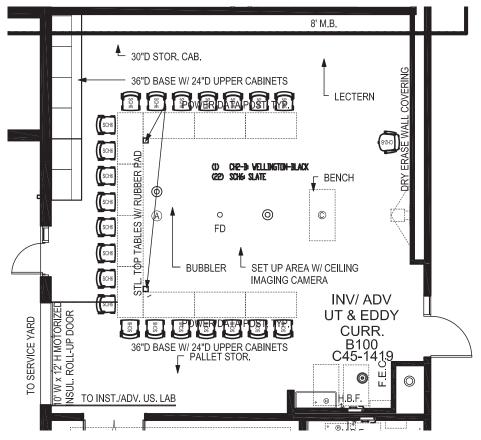
- Subdivided office space.
- Collaboration rooms.
- Accessory storage rooms (possibly shared between labs).

These spaces will include main line utility infrastructure running through the room.

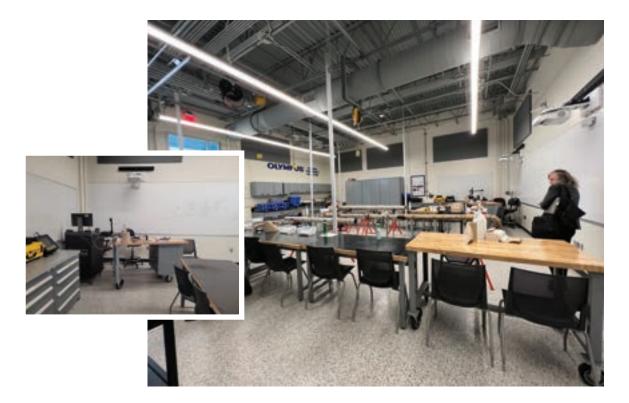
UTILITIES

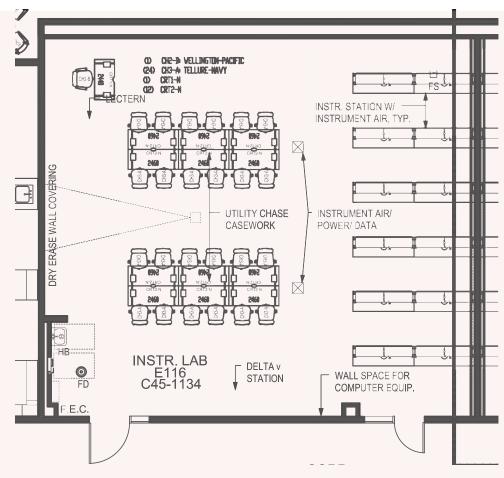
- Have their own individual electrical sub-panels with overhead / floor-mounted electrical access.
- Have hot and cold water supply.
- Have natural gas supply.
- Have compressed air supply.
- Have HVAC with high exhaust capability and enhanced accessible air filtration systems.
- Incorporate floor drains throughout the space.
- Integrate with the HUB's comm/data backbone for maximum information flow.
- Have specialized wastewater collection.
- Have chemical/vacuum traps and waste chemical disposal systems.
- Vertical chase for future specialized exhaust through roof.

MEDIUM LABORATORIES



San Jacinto College CPET Non-Destructive Testing Lab





San Jacinto College CPET Instructional Lab





LARGE LABORATORIES

Large laboratories are multi-purpose, shared spaces that can be customized for future use. These laboratories will include common utilities to service specific trades such as welding, chemical, and machine shops. These spaces will eventually be customized based on user, trade, or industry partner needs.

These spaces shall have:

PROPERTIES

- Square footage range between 2500 square feet to 3500 square feet.
- High bay ceilings open to structure.
- Incorporate sealed concrete floors.
- Have exterior access for loading/unloading and/or exterior testing and use.

SAFETY —

These spaces will include at room entrance:

- Emergency shower station.
- Emergency eye wash station.
- Hand wash area and sanitizer.
- First aid station.
- Cleaning station with eye protection and earplug dispensers.
- Emergency utility shut-off switches.

These spaces shall be customizable to accommodate areas large enough for:

FLEXIBILITY

- Subdivided office space.
- Collaboration rooms.
- Accessory storage rooms (possibly shared between labs).

These spaces will include main line utility infrastructure running through the room.

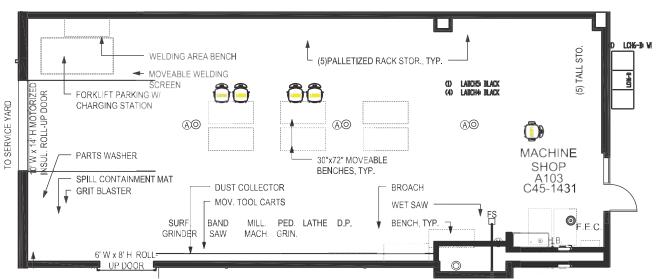
UTILITIES

- Have their own individual electrical sub-panels with overhead / floor-mounted electrical access.
- Have hot and cold water supply.
- Have natural gas supply.
- Have compressed air supply.
- Have HVAC with high exhaust capability and enhanced accessible air filtration systems.
- Incorporate floor drains throughout the space.
- Integrate with the HUB's comm/data backbone for maximum information flow.
- Have specialized wastewater collection.
- Have chemical/vacuum traps and waste chemical disposal systems.
- Vertical chase for future specialized exhaust through roof.

LARGE LABORATORIES



San Jacinto College CPET Machine Shop Lab



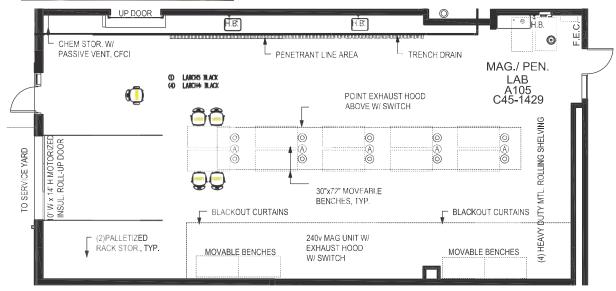
Wichita State University College of Applied Sciences & Technology Large Labs





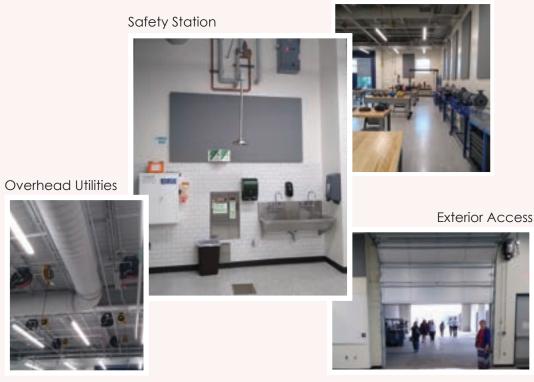
San Jacinto College CPET

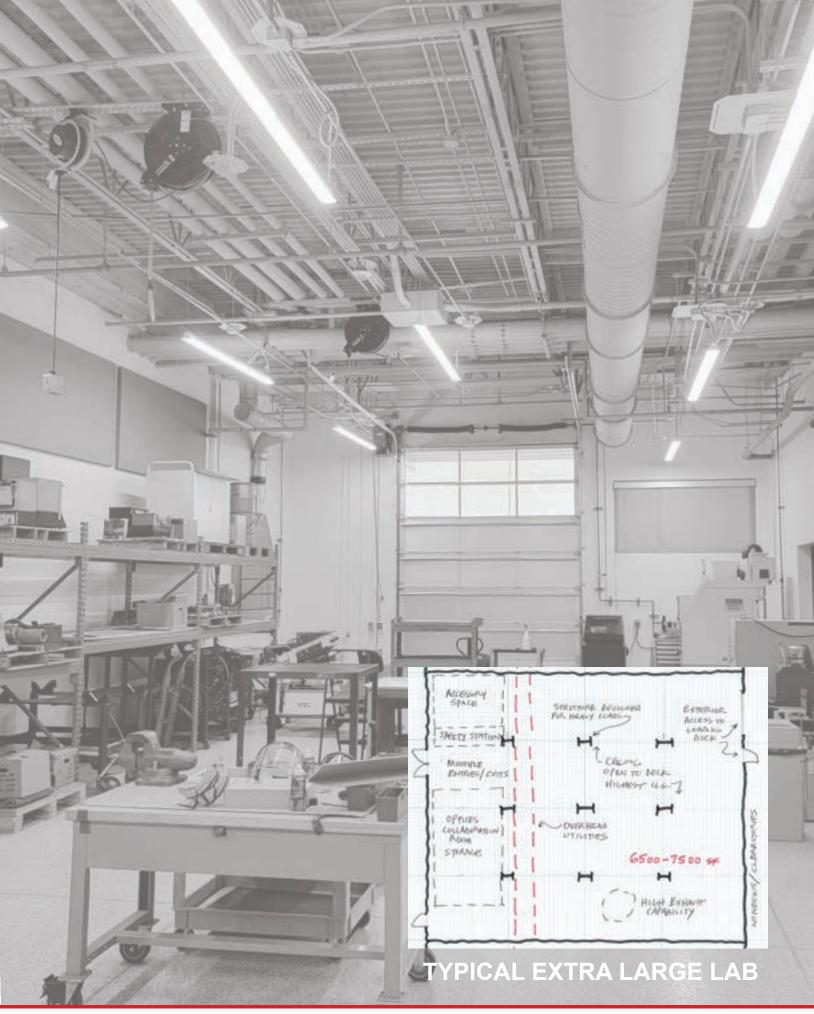
NDT Magnetic Particle Lab



AMENITIES

Hi-Bay Ceilings





EXTRA LARGE LABORATORIES

Extra Large laboratories are multi-purpose, shared spaces that can be customized for future use. These laboratories will include common utilities such loading dock access, tall rolling doors, bridge crane, and a wheeled crane. These spaces will eventually be customized based on user, trade, or industry partner needs.

These spaces shall have:

- Square footage range between 6500 square feet to 7500 square feet.
- High bay ceilings open to structure.
- Incorporate sealed concrete floors.
- Have exterior access for loading/unloading and/or exterior testing and use.

SAFETY

PROPERTIES

These spaces will include at room entrance:

- Emergency shower station.
- Emergency eye wash station.
- Hand wash area and sanitizer.
- First aid station.
- Cleaning station with eye protection and earplug dispensers.
- Emergency utility shut-off switches.

These spaces shall be customizable to accommodate areas large enough for:

FLEXIBILITY

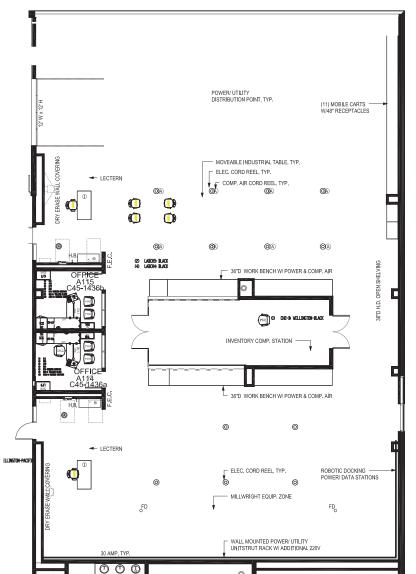
- Subdivided office space.
- Collaboration rooms.
- Accessory storage rooms (possibly shared between labs).

These spaces will include main line utility infrastructure running through the room.

UTILITIES

- Have their own individual electrical sub-panels with overhead / floor-mounted electrical access.
- Have hot and cold water supply.
- Have natural gas supply.
- Have compressed air supply.
- Have HVAC with high exhaust capability and enhanced accessible air filtration systems.
- Incorporate floor drains throughout the space.
- Integrate with the HUB's comm/data backbone for maximum information flow.
- Have specialized wastewater collection.
- Have chemical/vacuum traps and waste chemical disposal systems.
- Vertical chase for future specialized exhaust through roof.

EXTRA LARGE LABORATORIES





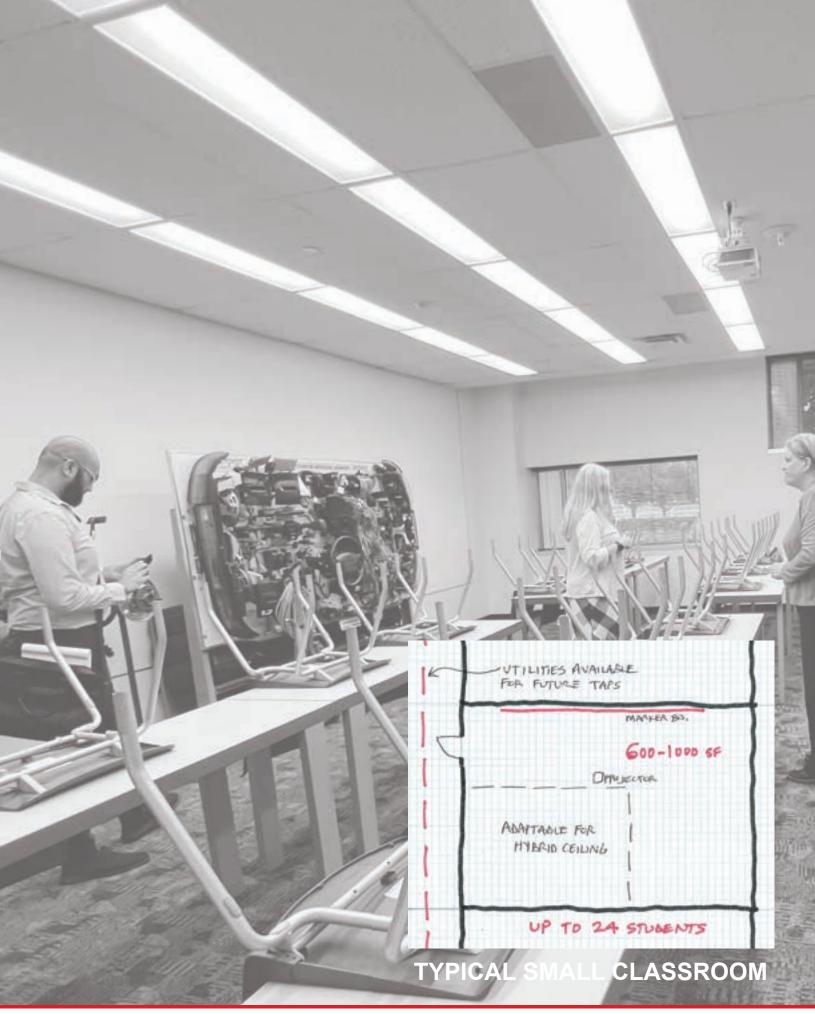






San Jacinto College Edge Center





SMALL CLASSROOMS

Small classrooms are flexible, shared spaces that can be switched between teaching, collaboration, and demonstration (electrical demonstration room) and serve 24 students. These spaces will include desk spaces, experiment tables, and state of the art comm/data equipment to observe, record, and analyze faculty and student work. Based on the trade or industry, classrooms will eventually be customized for future use.

Hybrid classrooms shall incorporate differing ceiling heights. The lower ceiling height areas will provide high light levels to the desk spaces beneath it. The areas open to structure shall be maintained for small scale experimental use. These hybrid classrooms will promote an efficient segue between theory and practice.

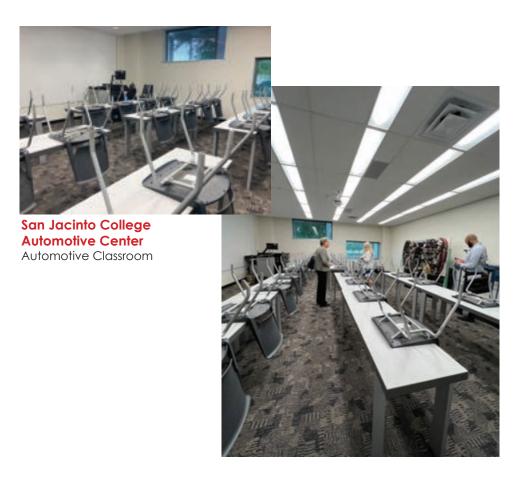
PROPERTIES These spaces shall have:

- Square footage range between 600 square feet to 1000 square feet.
- Standard ceiling height with lay-in ceiling system (and open partially to structure for hybrid classrooms).
- Incorporate carpet and/or tile flooring.
- Widened doors along corridor (demonstrations).
- Collaboration areas.

UTILITIES These spaces will include main line utility infrastructure for future utility taps inside the rooms.

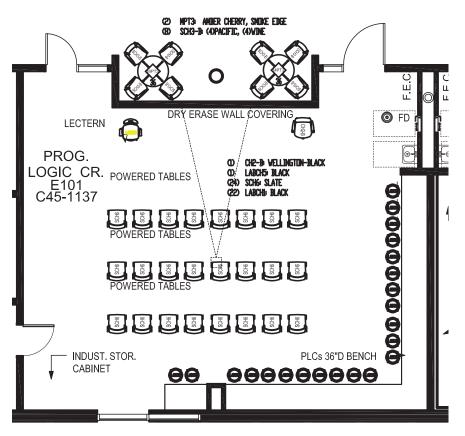
- Have projectors with projection screens.
- Integrate with the HUB's comm/data backbone for maximum information flow.
- Camera and webcam connections with real time streaming and recording.
- Overhead / floor mounted outlets.

SMALL CLASSROOMS





University of Houston Clear Lake Teaching Classroom



San Jacinto College CPET Program Logic Classroom



05



LARGE CLASSROOMS

Large classrooms are flexible, shared spaces that can switch between teaching, collaboration, and demonstration (electrical demonstration room). These spaces serve more than 24 students. The larger room has more wall space for extra marker and presentation boards and allows for larger demonstrations.

Such areas will include desk spaces, experiment tables, and state of the art comm/data equipment to record, observe and analyze faculty and student work. Based on the trade or industry, the classrooms will eventually be customized for future use.

PROPERTIES

These spaces shall have:

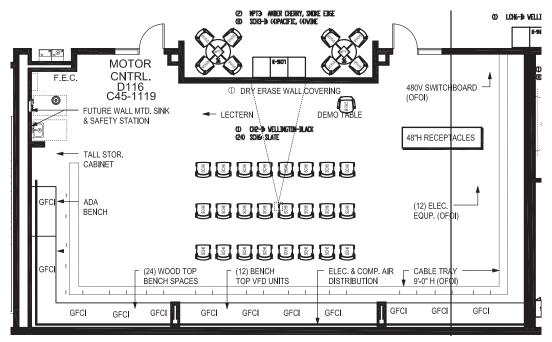
- Square footage range between 1200 square feet to 1800 square feet.
- Standard ceiling height with lay-in ceiling system.
- Incorporate carpet and/or tile flooring.
- Widened doors along corridor (demonstrations).
- Collaboration areas.

These spaces will include main line utility infrastructure for future utility taps inside the rooms.

UTILITIES

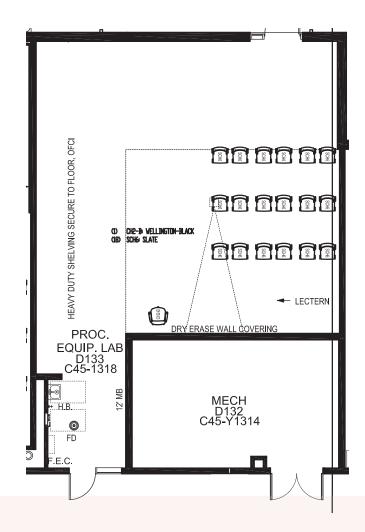
- Have projectors with projection screens.
- Integrate with the HUB's comm/data backbone for maximum information flow.
- Camera and Webcam connections with real time streaming and recording.
- Overhead / Floor mounted outlets.

LARGE CLASSROOMS



San Jacinto College CPET Motor Control Lab

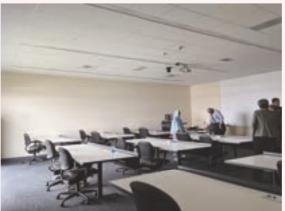








San Jacinto College CPET Proc. Equipment Lab Classroom



San Jacinto College Maritime Center Large Classroom



University of Houston Clear Lake Large Classroom

REMOTE LEARNING

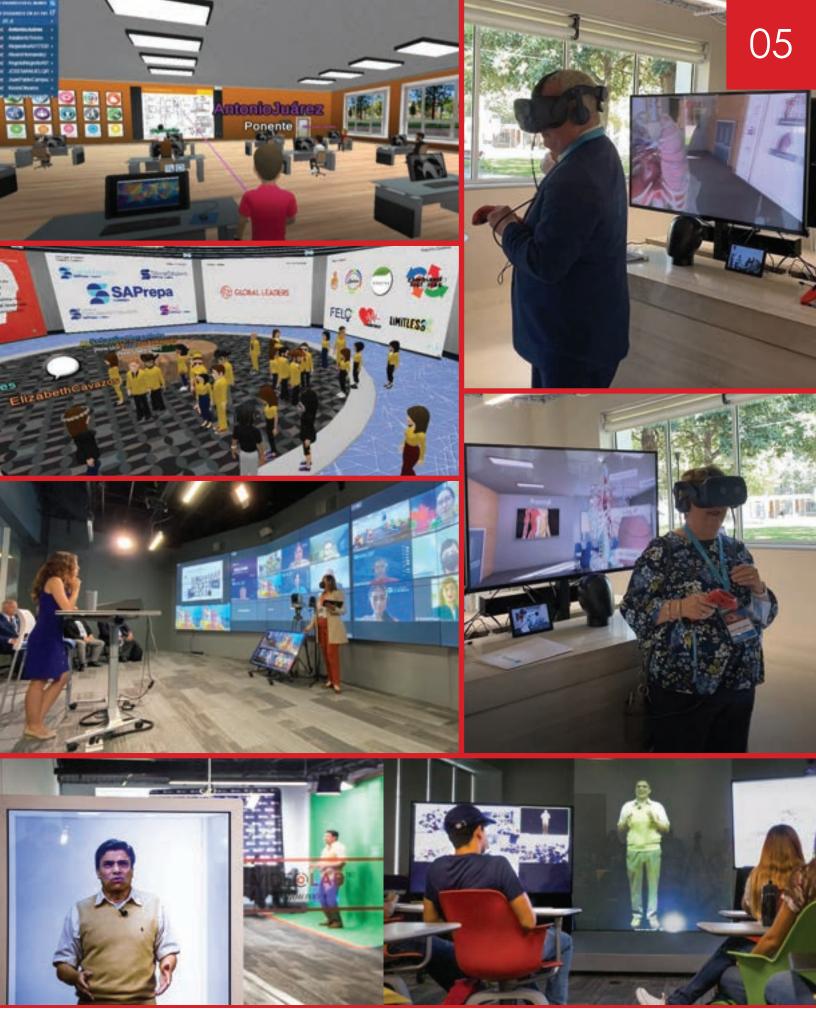
After an era like the COVID-19 pandemic, the shift to remote learning became very prevalent, allowing students to have more flexibility in their daily lives. This remote learning model can be embellished to offer students the same in-person experience from a distance, as done by the Tec de Monterrey. At this campus, a new Learning Space is designed to optimize remote learning experiences and benefit the interaction between students and teachers.

VIRTUAL REALITY Virtual Reality allows students to experience immersive learning in different disciplines. This technology can simulate educational experiences in complex environments. For example, in the aerospace industry, a student can learn the effects of propulsion in space. This technology can be implemented to address the challenges of the current and future world to benefit their training. HOLOGRAM **LEARNING** Hologram Technology is used to conduct lectures across various campuses (also known as Telepresence Lectures). A full body projection of a lecturer is shown in multiple classrooms simultaneously. This allows one teacher to expand their reach to students from different areas. BROADCAST **E-LEARNING** The Immersive Classroom integrates Video, Artificial Intelligence & Communications Technologies and it is designed for the transmission and delivery of Virtual Lectures. Broadcast e-learning goes beyond the capabilities of a Zoom call. There is an opportunity for life size face to face immersion. In this room the teacher can move around the classroom naturally and will be followed by the camera for fluidity of the experience. The students can remotely access the lecture but are visible to the professor at a normal live scale. This classroom arrangement helps students immerse themselves in the experience, which scientists call a 'Flow State'. Teachers also have a touch screen that works like an electronic whiteboard, where they can write their thoughts as they are explaining naturally. Immersion is achieved by incorporating state of the art technologies including video walls, Hi-Fi sound devices, artificial intelligence, and placement of a large number of screens in a semi-circular wall creating a high definition video wall emulating a lecture hall. METAVERSE The Metaverse is changing how we interact by creating innumerable Virtual Platforms for Commercial, Social, Educational, Research & Healthcare purposes. The advancement in Education worth noticing is happening at places like Tec de Monterrev with their Virtual Campus initiative. Here students attend classes virtually as 'Personalized

Avatars'. In this Virtual Campus created by Tec de Monterrey there are green lawns where you can sit and chat with friends, Auditoriums, Soccer Fields, Lighthouses and even a beach where you

can take a virtual break.

Gaming platforms such as Minecraft, Fortnite, Roblox are already great Metaverse prototypes. The Metaverse in the next step in our social interaction but it is entering into every facet of our life including education.



PROGRAMMED SPACES

Programmed spaces are a group of spaces that enhance and increse the efficiency of workforce training and higher education. These areas range from large multi-purpose spaces and lecture halls to war and conference rooms to facilitate every staff and student requirement.

MULTI-PURPOSE	
	 High ceiling with lay-in ceiling system. Square footage range between 4000 square feet to 4500 square feet. Carpet flooring.
	 Integrate with the HUB's comm/data backbone for maximum information flow. Have projectors with projection screens.
LECTURE HALL	
	 High ceiling with lay-in ceiling system. Square footage range between 3000 square feet to 4000 square feet. Carpet flooring.
	 Integrate with the HUB's comm/data backbone for maximum information flow. Have projectors with projection screens. Descending stepped floor layout.
AUDITORIUM	
FACULTY	 High ceiling with lay-in ceiling system. Square footage range between 3000 square feet to 4000 square feet. Carpet flooring. Integrate with the HUB's comm/data backbone for maximum information flow. Have projectors with projection screens. Raised front stage area.
LOUNGE	 Standard ceiling height with lay-in ceiling system. Square footage range between 2500 square feet to 3000 square feet. Carpet / tile flooring. Enough space for Hoteling and workstations. Shared areas between academic and industry partners. Basic kitchen amenities with hot and cold water supply.
STUDENT LOUNGE	 Standard ceiling height with lay-in ceiling system. Square footage range between 2000 square feet to 3000 square feet. Carpet / tile flooring. Computer workstations. Basic kitchen amenities with hot and cold water supply.

ADMIN SPACES Standard ceiling height with lay-in ceiling system. • Square footage range between 2500 square feet to 3000 square feet. • Carpet flooring. • Integrate with the HUB's comm/data backbone for maximum information flow. **MEDIA CENTER** Standard ceiling height with lay-in ceiling system. • • Square footage range between 1000 square feet to 2000 square feet. Carpet flooring. • Integrate with the HUB's comm/data backbone for maximum information flow. Have projectors with projection screens. Enough space for collaboration areas. WAR ROOM Standard ceiling height with lay-in ceiling system. • War room square footage range between 1200 square feet to 1800 square feet. . Carpet flooring. Coffee maker and mini fridge. Integrate with the HUB's comm/data backbone for maximum information flow. Have projectors with projection screens. • CONFERENCE ROOM Standard ceiling height with lay-in ceiling system. • Conference room square footage range between 200 square feet to 500 square feet. . Carpet flooring. . Coffee maker and mini fridge. Integrate with the HUB's comm/data backbone for maximum information flow. . Have projectors with projection screens.

PROGRAM TABLE - AREA ALLOCATION AND PHASING

PHASE I

Room Type	Quantity	Square Feet	No. of People	Total SF	Reference	Notes	
San Jacinto College Spaces							476
Admin Suite	1	100		100	D140		
Admin Office	1	190		190	PMO		
Staff Workspace	2	48		96	PMO		
Executive Office	1	190		190	PMO		
UH -Clear Lake Spaces							476
Admin Suite							
Admin Office	1	190		190	PMO		
Staff Workspace	2	48		96	PMO		
Executive Office	1	190		190	PMO		
Texas Southern University Spac	es						476
Admin Suite							
Admin Office	1	190		190	PMO		
Staff Workspace	2	48		96	PMO		
Executive Office	1	190		190	PMO		
Rice University Spaces							476
Admin Suite							
Admin Office	1	190		190	PMO		
Staff Workspace	2	48		96	PMO		
Executive Office	1	190		190	PMO		
Shared Spaces							66,500
Lab - Extra Large	2	5400		10800	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Large	2	3500		7000	CPET - SJC		
Lab - Medium	2	1600		3200	CPET - SJC	Exterior access	
Lab - Small	4	1000					
Classroom - Medium	2	1500		3000	UHCL		
Classroom - Small	4	900		3600	UHCL		
Conference Room	2	1400	25	2800	PMO		
Media Center/ Library	1	3600		3600	UHCL		
Faculty Lounge (shared)	1	3000		3000	CPET - SJC		
Student Lounge (shared)	1	3000		3000	UHCL		
Collaborative Spaces	4	2000		8000	UHCL		
Lecture Hall	2	2400		4800	UHCL		
Multipurpose Room/ Auditorium	1	4200		4200	PMO		
Cafeteria/Commercial Kitchen	1	3000		3000			
Commons Space	1	2000		2000			
Exhibition Space	1	500		500			
Demonstration Space	1	500		500			
Reception	1	500		500			
Vendor Space	4	750		3000			
Building Support							6,100
Electrical Room	2	200		400	Standard		0,100
Mechanical Room	2	200		400	Standard		
Fire Riser	1	150		150	Code		
Women's RR	1	1200		1200	Code		
Men's RR	1	1200		1200	Code		
Elevator	4	100		400	Code		
Freight Elevator	2	200		400	2000		
MDF	1	500		500			
Storage - large	4	300		1200		with garage dock	
Security	1	100		100			
Building Maintenance	1	150		150			
	-	200					
Total Program SF				74,504			
Circulation (25%)				18,626			
TOTAL				93,130			

The program for the Aerospace Institute has been consolidated into these tables and divided into four phases. The first phase will include all the core functions for the institute along with labs and classrooms. The additional three phases will expand in a modular fashion.

PHASEI	93,130 SF
PHASE II	+ 27,105 SF
PHASE III	+ 65,585 SF
PHASE IV	+ 65,585 SF
TOTAL PROGR	AMMATIC SPACE FOR ALL PHASES: 251,405 SF

PHASE II

Room Type	Quantity	Square Feet	No. of People	Total SF	Reference	Notes	
Shared Spaces							17,000
Lab - Large	2	3500		7000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Medium	2	1600		3200	CPET - SJC	Exterior access	
Lab - Small	2	1000		2000			
Classroom - Medium	2	1500		3000	UHCL		
Classroom - Small	2	900		1800	UHCL		
Building Support							3,850
Electrical Room	1	200		200	Standard		
Mechanical Room	1	200		200	Standard		
Women's RR	1	600		600	Code		
Men's RR	1	600		600	Code		
Elevator	1	100		100	Code		
Freight Elevator	1	200		200			
MDF	1	500		500			
Storage - large	4	300		1200		with garage dock	
Security	1	100		100			
Building Maintenance	1	150		150			
Total Program SF				20,850			
Circulation (30%)				6,255			
TOTAL				27,105			

PHASE III

Shared Spaces						45,000
Lab - Extra Large	2	3500	7000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Large	4	3500	14000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Medium	4	1600	6400	CPET - SJC	Exterior access	
Lab - Small	8	1000	8000			
Classroom - Medium	4	1500	6000	UHCL		
Classroom - Small	4	900	3600	UHCL		
Building Support						5,450
Electrical Room	1	200	200	Standard		
Mechanical Room	1	200	200	Standard		
Women's RR	1	900	900	Code		
Men's RR	2	900	1800	Code		
Elevator	2	100	200	Code		
Freight Elevator	1	200	200			
MDF	1	500	500			
Storage - large	4	300	1200		with garage dock	
Security	1	100	100			
Building Maintenance	1	150	150			
Total Program SF			50,450			
Circulation (30%)			15,135			
TOTAL			65,585			

PHASE IV

Shared Spaces						45,000
Lab - Extra Large	2	3500	7000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Large	4	3500	14000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Medium	4	1600	6400	CPET - SJC	Exterior access	
Lab - Small	8	1000	8000			
Classroom - Medium	4	1500	6000	UHCL		
Classroom - Small	4	900	3600	UHCL		
Building Support						5,450
Electrical Room	1	200	200	Standard		
Mechanical Room	1	200	200	Standard		
Women's RR	1	900	900	Code		
Men's RR	2	900	1800	Code		
Elevator	2	100	200	Code		
Freight Elevator	1	200	200			
MDF	1	500	500			
Storage - large	4	300	1200		with garage dock	
Security	1	100	100			
Building Maintenance	1	150	150			
Total Program SF			50,450			
Circulation (30%)			15,135			
TOTAL			65,585			

05

DESIGN CONCEPT

"Space" represents Infinite preschilities for Non Kund Bygond thine [... as we embastle to emplose the Universe] . Simplify of Jay Jones · Clasely of Micis · Spec of dust · Infinity · Infinite Aprice · Radio Wave Mary TT pë Infinity Regular Stopes. Germotric Forms Infinite lossborbiles accuracy in Mature & evoluty is time ! Organe

CONCEPT

RESEARCH

As the HAS Aerospace Institue begins to develop, it is imperative to have an underlying design concept that informs future development and architecture on and around the site. This will ensure the cohesive nature of potential future expansion.

Being a center for space exploration, the Aerospace Institute at the Houston Spaceport Masterplan Concept derives from the essence of space. "Space" itself is rather vague and ambiguous but it can be described with one word: **INFINITY**.

Infinite space. Infinite opportunities. Infinite possibilities.

"Space" represents infinite possibilities for mankind as we embark to explore the Universe. Since 1958, the year NASA was established, mankind has made impressionable footprints in Space. From sending the first people to the Moon, to developing the International Space Station, the opportunities of exploration in space are endless. The Houston Spaceport aspires to be the grounds of great space discoveries for the future.

One example of recent discoveries is the character of black holes.

"Black Holes are where God decided to divide by 0." - Albert Einstein

Dividing by zero equals infinity. Blackholes only emit Radio Waves and X-rays. These cannot be seen with the human eye.

Radio Waves are the primary mode for communication in Space.

Sound cannot travel in space because there are not molecules close enough together to transmit sound between them.

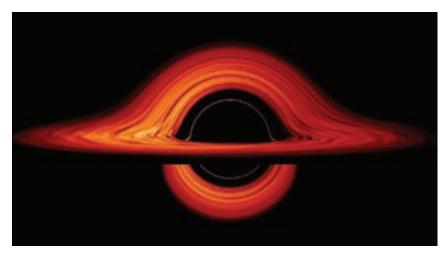


Figure 6.1 Visualization of black hole provided by NASA illustrates how its extreme gravity can distort light

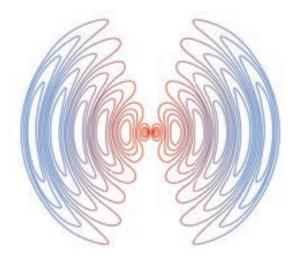
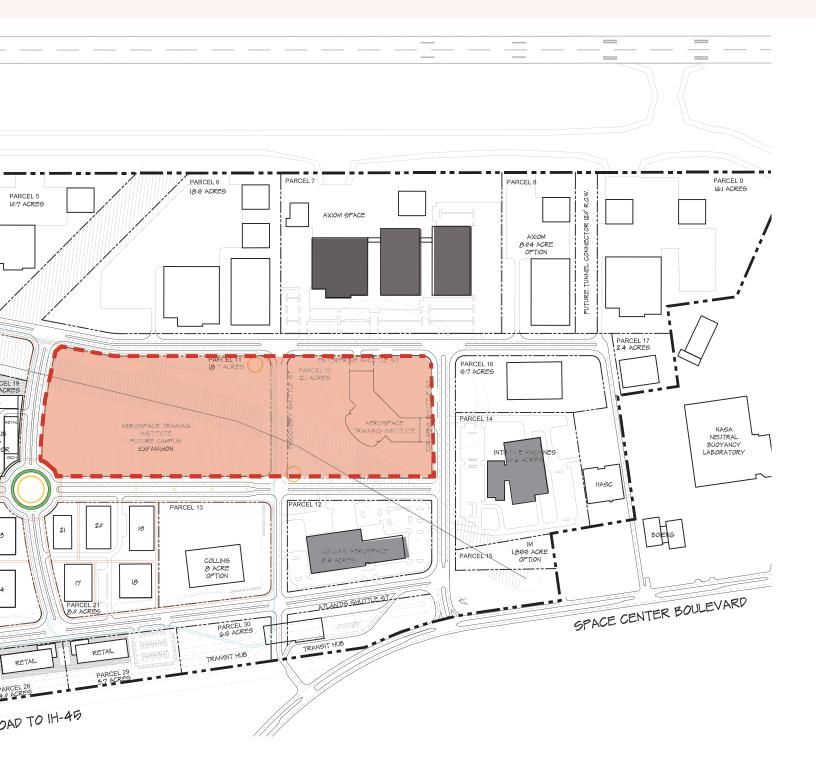


Figure 6.2 Illustration showing the electric field lines of half-wave dipole antenna radiating radio waves

MASTER PLANNING

F S Group Architects, along with Jacobs Engineering, developed a land use plan for the 400+ acres of the Houston Spaceport in which parcels and site work were defined. The area shaded in pink (roughly 35 acres) has been designated as the site for the Aerospace Institute campus. The rest of the site has been allocated for aerospace industry partners, commercial and retail space, green parks, and parking.

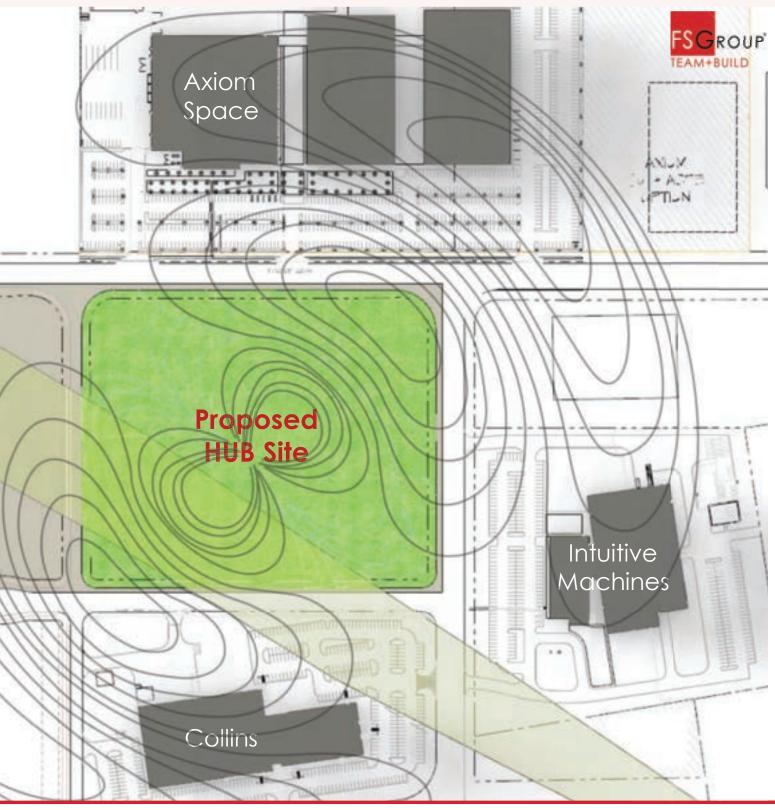




PROPOSED CONCEPT

In order to develop a cohesive campus, F S Group Architects incorporated the design concept of bipolar radio waves on the Houston Spaceport Masterplan to better inform the essence of the campus. The central point of the radio waves have been placed at the center of the proposed HUB site and is aligned with the existing geological fault line. The emanating radio waves from this point travel towards the existing industry partners.

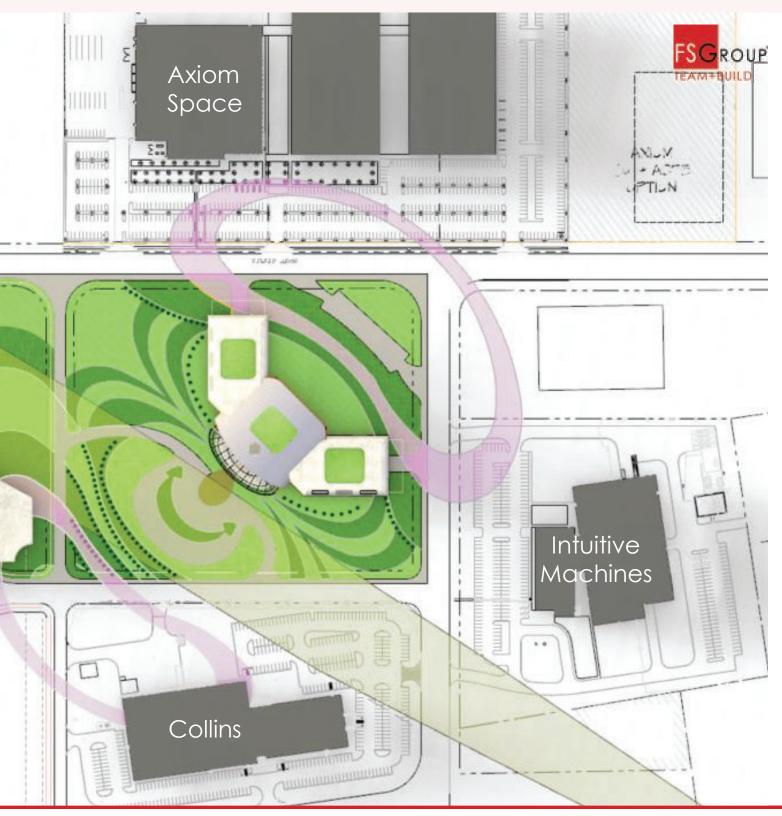




PROPOSED MASTERPLAN

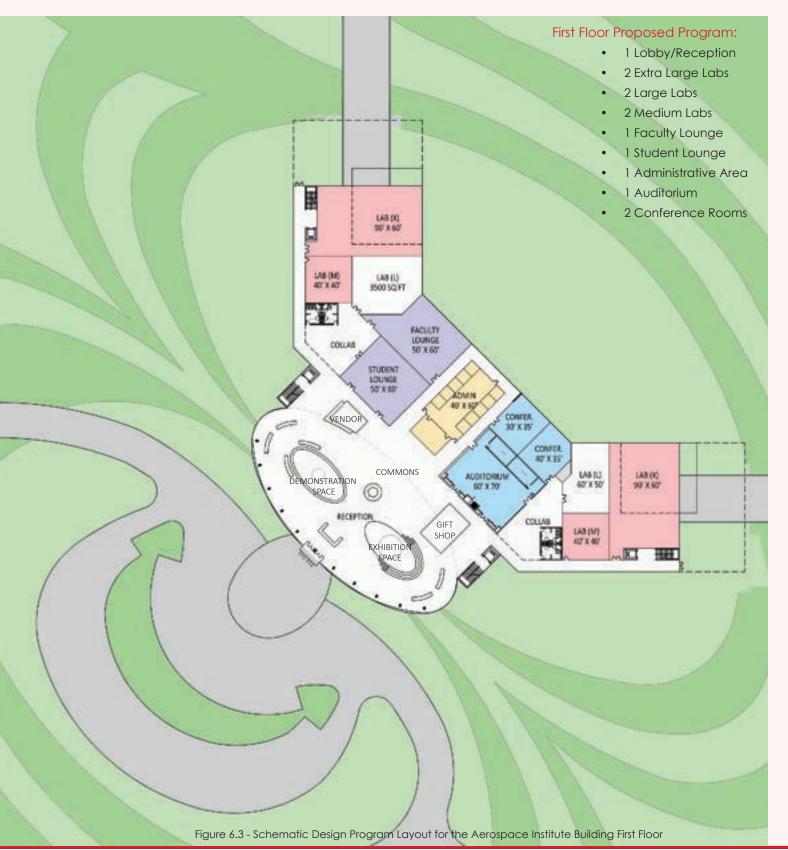
F S Group developed the Masterplan below based on the square footages from the program for the Aerospace Institute HUB. Based on conversations with HAS and the academic/industry partners, the Aerospace Institute can foresee future expansion based on research/training requirements in the industry as they are being quickly developed.

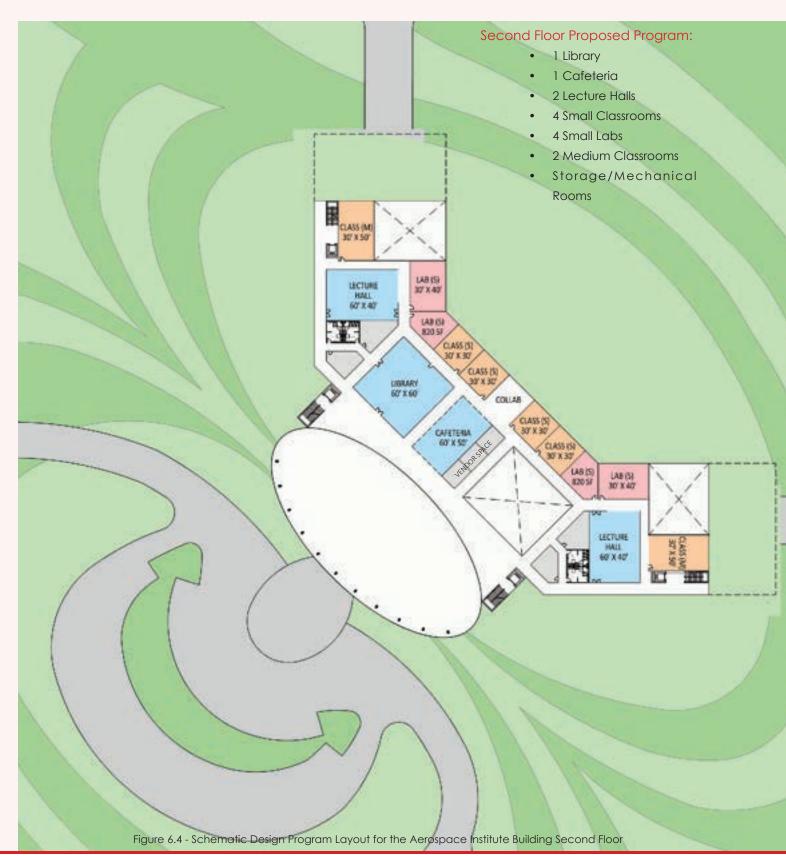




BUILDING DESIGN CONCEPT

Based on the conversations with industry partners and institutions, FSG proposed several schematic layouts for the program to accommodate the needs the Aerospace Institute. Below is a diagram of one of the schemes which shows flexibility in future expansion.





06

MODULAR BUILDING EXPANSION

Phase I

Building Footprint 59,000 SF

Total SF 93,130 SF

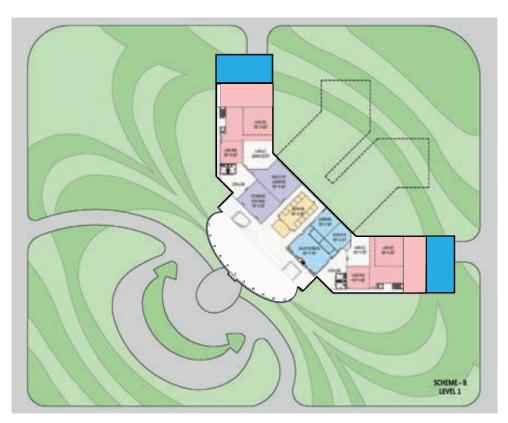


88,500 SQ FT 70,000 SQ FT

Phase II

Expansion SF 27,105 SF

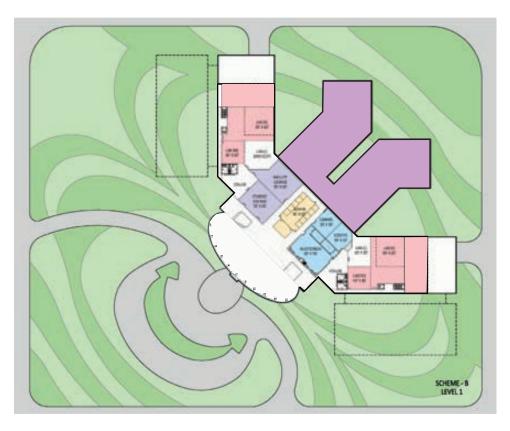
Cumulative Total SF 120,235 SF



Phase III

Expansion SF 65,585 SF

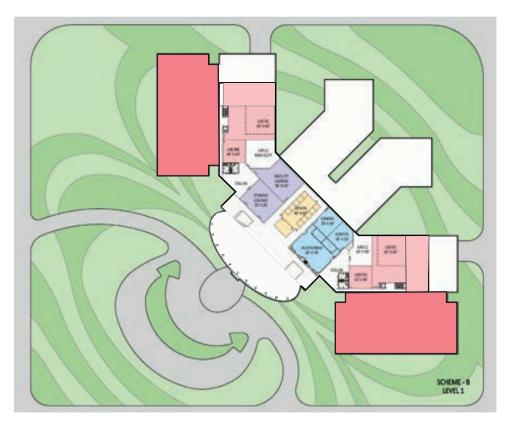
Cumulative Total SF 185,820 SF



Phase IV

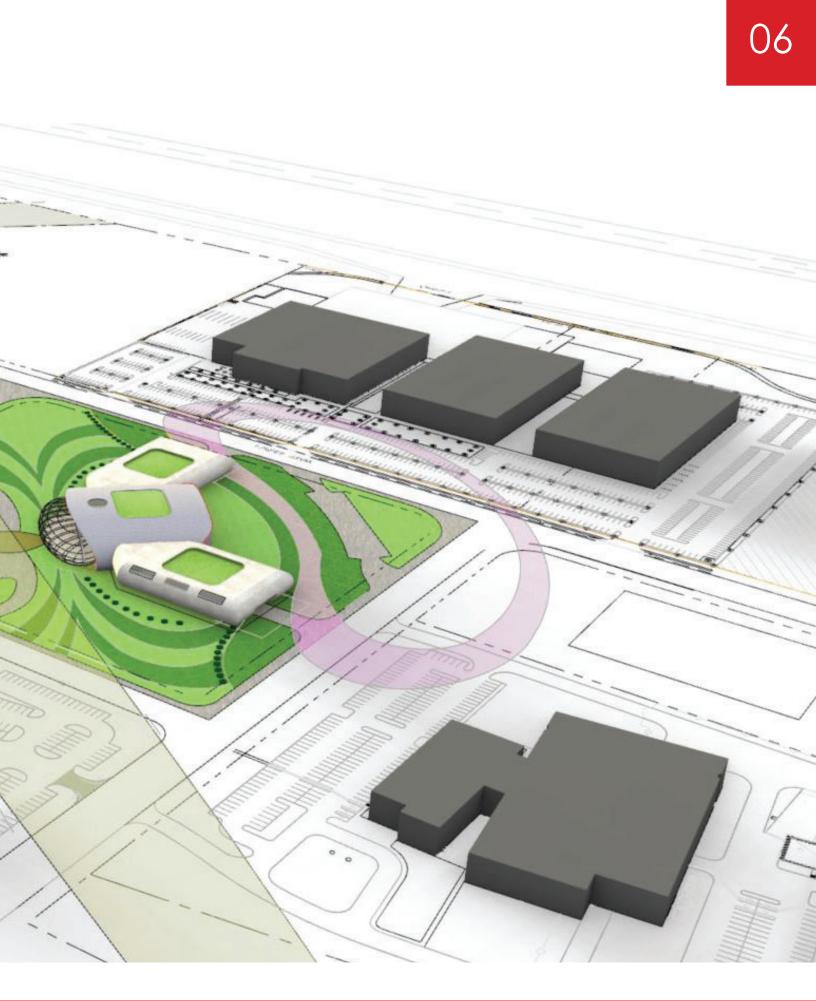
Expansion SF 65,585 SF

Cumulative Total SF 251,405 SF



06 PROPOSED MASTERPLAN







06



06

07 BUILDING APPROACH

- CODE APPROACH
- ESTIMATED BUDGET
- SUSTAINABILITY
- CONSTRUCTABILITY
- STRUCTURAL NARRATIVE
- LANDSCAPE NARRATIVE

"Space" represents Infinite preschilities for Non Kund Bygond thine [... as we embast to emplore the Universe] . Simplify of Jay Jones · Clasely of Micis · Spec of dust · Infinity · Infinite Aprice · Radio Wave Mary TT pë Infinity Regular Stopes. Germotric Forms Infinite lossborbiles accuracy in Mature & evoluty is time ! Organe

CODE APPROACH



The Aerospace Institute is an educational building. It is classified as an Educational occupancy under the International Building Code, and it will include Assembly spaces in the lobby, lecture halls, and conference rooms. The building will be designed to meet or exceed all applicable construction and life safety codes:

- 2015 International Building Code
- 2020 National Electric Code
- 2015 International Fire Code
- 2015 Uniform Mechanical Code
- 2015 Uniform Plumbing Code
- 2015 International Energy Conservation Code
- National Fire Protection Association NFPA101
- Texas Accessibility Standards
- City of Houston Code Amendments

Code enforcement for the HUB Building shall be managed through HAS' Building Standards Group, which will perform plan review and inspection services.

Life Safety features shall include wide exit corridors with clear paths to exits, and an open lobby with multiple exit options in the area of greatest concentration of occupants. The building will be fully-sprinklered, with fire alarms and emergency lighting on battery backup. In laboratories, duct smoke detectors, special gas detectors, and smoke evacuation systems will be included as appropriate.

The building will be fully accessible, including gentle-approach walkways with power-operated entry doors, accessible eyewash and first aid stations at labs, accessible seating in classrooms for students and faculty, and all of the standard accessible features included in the Texas Accessibility Standards.

ESTIMATED BUDGET

The construction cost estimate of the Aerospace Institute includes site work of the existing flat grassland 17 acre site, and the construction of the HUB shell building. The site work costs were estimated using R.S. Means data, and the HUB cost was estimated using ballpark square footage costs discussed during the June 24, 2002 Spaceport Board Meeting.

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R.S. Means preliminary estimate for Site Work.

- Site Work Includes scraping and grubbing; grading; lime stabilization; curb & gutter; sidewalks & flatwork; parking lots. Estimate \$493,000.
- HUB Building Phase I Includes shell building construction. Estimate \$35,362,000. (88,405 SF x \$400 / SF)
- Total Site Work & Phase I Building = \$35,855,000.
- Proposed working budget, including future cost escalation = \$40,000,000.

SUSTAINABILITY

The Aerospace Institute will be designed to USGC's LEED standards for sustainable materials. The goal of LEED is to create a building that should save money, improve efficiency, lower carbon emissions, and create healthier places for people.

Sustainable features of the HUB building may include:

- Glue-laminated wood beams supporting the glass skylight wall.
- Green roof with vegetation to absorb heat and produce oxygen.
- Optimized energy performance The air conditioning system will cool and exhaust large amounts of air due to laboratories, and the highest efficiency in conditioning air will help keep long-term energy costs low.
- Low-emitting materials Sustainable building materials and finishes.
- Daylighting Skylight wall at the entry atrium.
- Quality views From the second floor of the atrium and from the roof overlooking Spaceport runways.
- Acoustic performance Important for controlling sound at a crowded lobby and from machinery operating in labs.
- Innovation In overall building design, innovative landscaping, and new technologies in materials.
- Regional priority Using locally-sourced building materials and finishes (wood beams, ceramics and finishes, landscaping).

Sustainable features of the HUB site may include:

- Sensitive land protection The curved and rolling landscape which is a low-impact development (LID) drainage system, slowing the stormwater runoff and reducing stormwater detention areas.
- Access to quality transit As an educational building, public transit connections will be incorporated into the parking lot area.
- Bicycle facilities Generous parking for bicycles and alternative personal transport.
- Green vehicles Preferred parking and charging stations.
- Heat island reduction With the extensive landscape areas in the no-build fault zone across the site.
- Light pollution reduction Efficient lighting for dark sky compliance and to reduce glare for Spaceport and airport operations.

The items listed above contribute to the overall mathematical calculation which determines the level of LEED certification. A LEED Gold rating should be attainable for this project within the current design parameters.

SUSTAINABILITY

LEED POINT SYSTEM



LEED v4 for BD+C: New Construction and Major Renovation Project Checklist

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?	N								
	Credit	Integrative Process	1						
0	0 Locat	tion and Transportation	16	0	0	0	Mat	erials and Resources	13
	Credit	LEED for Neighborhood Development Location	16	Y		1 .	Prereq	Storage and Collection of Recyclables	Required
	Credit	Sensitive Land Protection	1	Y			Prereq	Construction and Demolition Waste Management Planning	Required
	Credit	High Priority Site	2				Credit	Building Life-Cycle Impact Reduction	5
	Credit	Surrounding Density and Diverse Uses	5				Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
	Credit	Access to Quality Transit	5				Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
	Credit	Bicycle Facilities	1				Credit	Building Product Disclosure and Optimization - Material Ingredients	2
	Credit	Reduced Parking Footprint	1				Credit	Construction and Demolition Waste Management	2
	Credit	Green Vehicles	1						
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	Prereq	Construction Activity Pollution Prevention	Required	Y			Prereq	Environmental Tobacco Smoke Control	Required
	Credit	Site Assessment	1				Credit	Enhanced Indoor Air Quality Strategies	2
	Credit	Site Development - Protect or Restore Habitat	2				Credit	Low-Emitting Materials	3
	Credit	Open Space	1				Credit	Construction Indoor Air Quality Management Plan	- 1
	Credit	Rainwater Management	3				Credit	Indoor Air Quality Assessment	2
	Credit	Heat Island Reduction	2				Credit	Thermal Comfort	- 1
	Credit	Light Pollution Reduction	1				Credit	Interior Lighting	2
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	Credit	Renewable Energy Production	2						
		Enhanced Refrigerant Management	1						
			1						
	Credit	Green Power and Carbon Offsets	2						

Project Name:

CONSTRUCTABILITY



The HUB Building will be built with conventional materials in a pre-engineered steel frame. The goal is for the building to appear as a customized design achieved through a cost-effective approach.

The entry lobby will include a curved insulated glass skylight wall supported by steel-reinforced gluelaminated wood beams. A second floor loft open to the atrium should maximize usable space on each floor. Rooms behind the lobby are on a rectangular steel grid.

The side wings will be designed on a modular structural grid with repeating equal bay spacings for ease of construction and maximum utility for future room arrangement. Conventional pre-engineered metal frames and steel joists will support a concrete over metal deck second floor.

The exterior skin shall include horizontal solar louvers to reduce heat gain along exterior walls and high efficiency insulated glazing panels at the entry atrium. The roof will include reflective curved metal panels to deflect heat. A large area of the roof will include flat areas adaptable for vegetative planting for heat absorption, rain water collection, or drone flight control and landings.



Structural Narrative

The proposed new Aerospace Institute facility is 2-story structure with an 59,000 SF footprint and a Phase I overall building square footage of 88,000 SF. The "radio wave" concept design features an elliptical lobby area, curved wall surfaces, and a green roof. Structural systems will include concrete, structural steel, and wood design elements to create this dynamic space that will inspire creativity and innovation in all that visit the facility.

Design Standards

Applicable Structural Codes and Design Guides

- International Building Code (IBC), 2015 Edition (with City of Houston Amendments)
- ASCE 7-10 Minimum Design Loads for Buildings and Other Structures
- ACI 318 Building Code Requirements for Structural Concrete
- ACI 530 Building Code Requirements for Masonry Structures
- AISC Manual of Steel Construction (LRFD) 15th Edition
- American Institute of Timber Construction (AITC)
- FM Global Design Criteria
- 2012 Texas Accessibility Standards (TAS)
- American with Disabilities Act (2010 ADA Standards)

Structural Systems

Foundations

Foundations for the new Aerospace Institute will be designed and detailed in strict accordance with the recommendations outlined in the geotechnical report that will be prepared specifically for this project. Based on information provided in geotechnical report for the adjacent Axiom site, it is anticipated the following systems will be used.

- Slab-on-Grade: Existing expansive soil will be removed and replaced with structural select fill material having a liquid limit (LL) less than 40 and a plasticity index (PI) between 8 and 20, as evaluated by ASTM D4318. The pad will be 4 to 6-feet thick and will extend at least 5-feet beyond the building footprint. Slab thickness will be 8-inches in lab spaces and 5" in all other areas. Concrete slabs will be placed over a 15-mil vapor barrier.
- Pier Foundations: Columns and grade beams will likely be supported by straight shaft piers bearing at 30-feet or more below ground level, or by underreamed (belled) piers bearing at approximately 10-feet below existing grade. In either case, temporary casing will be required to mitigate groundwater seepage during pier drilling operations. Groundwater is present at the site at shallow depths varying between 3 and 15-feet below grade.
- Grade Beams: Perimeter grade beams, 18" to 24" wide and 24" to 30" deep will be provided around the entire building. Interior grade beams may be required to support tall walls or to provide foundation continuity at brace or wind frame locations.



2nd Floor Structure (and Green Roof)

The 2nd floor will be designed as a composite floor system that will allow for longer spans, shallower structural members, and provide better control of deflections and vibration. Composite floor will be 4 1/2" thick, normal-weight concrete over 2" deep, 20-gauge steel deck (6 1/2" total thickness). Shear connectors will be used at approximately 12" on center to attach floor deck to the beams and to provide the mechanism that allows the floor structure to act as a composite system. Wide flange beams will be spaced at maximum of 8'-6" on center (assuming two-span condition) so that shoring of the deck is not required. A continuous bent plate will be used at floor perimeter and to frame openings at stairs and elevator shaft. This same system will be used at portion of the roof supporting vegetation.

Roof Structure

The roof structure will be comprised of conventional steel wide flange beams and openwebbed steel joists spaced 5 to 6-feet on center. Roof members will be rolled to achieve the curved roof profile. The roof deck will be 20-gauge, 1 1/2" deep, Type B (wideribbed) galvanized decking. The structural deck will support the load of the roofing materials and transfers lateral diaphragm loads to the wind-resisting brace elements and/or shear walls. The green roof portion will be framed same as the floor structure to provide additional load-carrying capacity and to accommodate waterproofing systems.

Roof beams will be supported on interior and exterior columns that will transfer loads down to the foundation. A prefabricated or modular system can be utilized since there will be repetitive design elements.

The lobby area will have a unique framing system that will include curved glulam beams to create the exterior walls and roof. The wood framing in combination with steel elements will support the glazing materials used for the wall and roof.

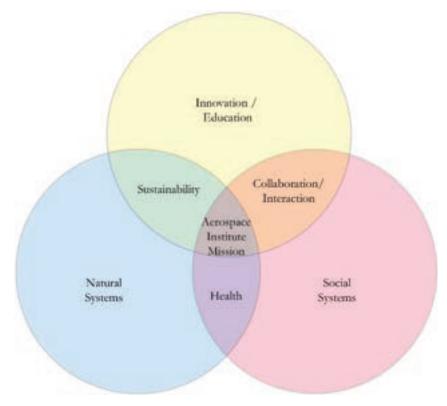
Lateral Load-Resisting System

A combination of chevron-shaped braces and rigid frames will provide resistance to wind and seismic loads for the 2-story building. Use of shear walls may also be investigated if concrete or masonry walls are utilized.



Aerospace Institute - Houston Spaceport Landscape Architecture Narrative

We have the opportunity to provide a landscape architecture program that integrates innovation and education with both social and natural systems. By doing so we create an opportunity to establish and nurture a healthy, sustainable and interactive environment. Collectively we will create a program that will keep the Aerospace Institute's mission at its core. From there we can radiate this program throughout the campus by utilizing high level design to provide a campus that seamlessly connects the built environment, natural environment and our continually-evolving social environment.



Sustainable practices provide a system that works within itself to provide a healthy vibrant environment. The health benefits of landscapes within the industrial and educational settings are proven.

I.	Symptom reduction of depression and	II.	Visual and tactile interaction with
	PTSD		nature
III.	Increase overall physical health	IV.	Source of creative inspiration
V.	Increased focus		

There is also an opportunity to enhance the collaborative and interaction experience within the landscape by providing an immersive landscape.

I.	Provide areas to assemble	II.	Provide group learning space

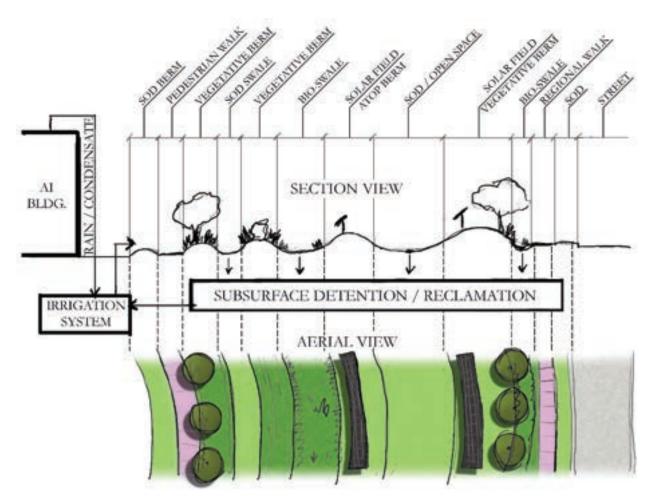
1923 Victoria Garden Dr. Richmond, TX 77406 (c)409.382.0698 email: kyle@brunolanddesign.com www.brunolanddesign.com

III.	Provide experimental testing spaces	IV.	Provide more private areas of reflection and study.
V.	Provide areas for recreation	VI.	Provide pedestrian connectivity

Where innovation and education meet our natural system, we are presented with the ability to incorporate sustainable practices to enhance our built environment.

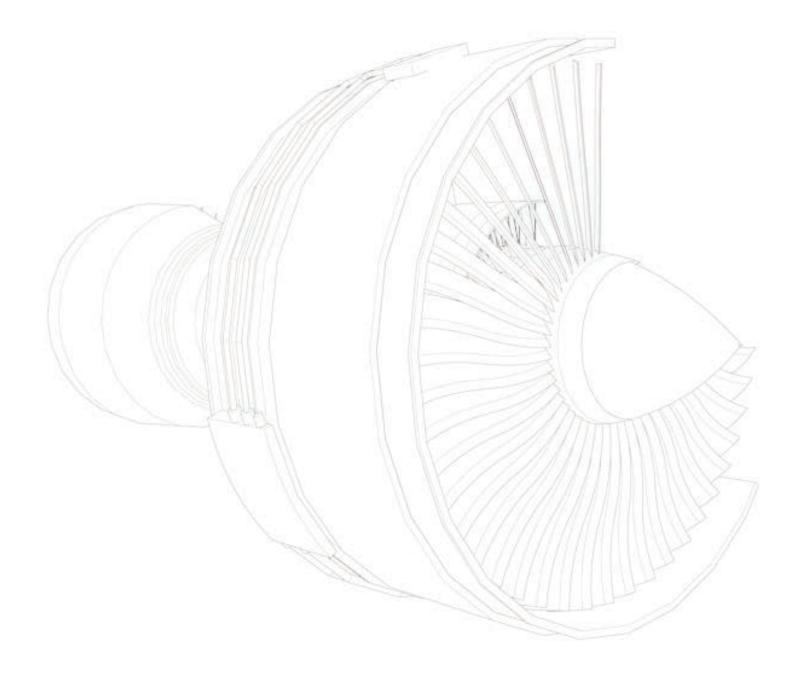
I.	Energy Efficiency	II.	Irrigation
	a. Green Roofs		a. Point Source Irrigation
	b. Solar Fields		b. Reclaimed Irrigation System
	c. Permeable Pavement		c. Low Flow Irrigation Material
	d. Tree Planting		
III.	Water Treatment & Reclamation	IV.	Native Planting
	a. Catch Basins & Cisterns		a. Lower Maintenance
	b. Bio-swales		b. Low Water Needs
	c. Permeable Pavement		c. Diverse Varieties
	d. Sub-surface Detention		





email: kyle@brunolanddesign.com www.brunolanddesign.com 07

O8 TEXAS SOUTHERN UNIVERSITY ACADEMY FOR AVIATION & ADVANCED TECHNOLOGY



DESIGN CONCEPT

The TSU Academy for Aviation and Advanced Technology at the Houston Spaceport takes its inspiration from the initial structure of the Wright Brothers' planes as well as the sophisticated turbine engines of the Jet liners. These together create a state of the art Education and Training Facility.

The entry facade of the building is inspired by the geometry of the turbine engine. The building elevations are inspired by the Wright Brothers twin Canard Aircrafts.

The TSU Academy at the spaceport will house all the Aviation Education & Training Divisions including:

- Aviation Management,
- Aviation Mechanic Program,
- Pilot Training and
- Drone Training Programs.



The design of the entry facade is inspired by the commercial turbine engines as shown in this image.



The Wright Brothers Twin Canard aircraft inspired the concept for the building elevation.

PROGRAM TABLE - AREA ALLOCATION AND PHASING

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Texas Southern University plans to expand their B.S. in Aviation Science Management program. This academic program is divided into 5 different concentrations: Aviation Management, Professional Pilot, Air Traffic Control, Drone Education, and Aircraft Mechanics. Based on the expansion of this degree program, below is an architectural program table indicating the spaces required to accommodate the expanded curriculum.

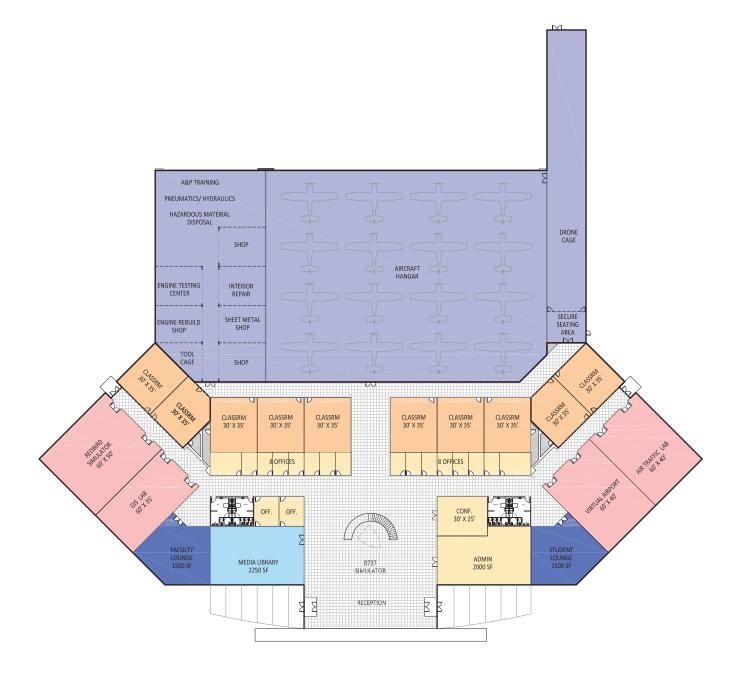
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	TSU Center for Aviation and Aerospace Program										
Room Type	Quantity	Square Feet	No. of People	Total SF	Reference	Notes					
Texas Southern University											
Administrative & Shared Spaces							15,250				
Admin Suite							13)230				
Admin Office	2	200		400	PMO						
Staff Workspace	3	50		150	PMO						
Executive Office	1	200		200	PMO						
Conference Room	1	1400	25	1400	PMO						
Media Center/Library	1	3600	25	3600	UHCL						
Faculty Lounge	1	1500		1500	CPET - SJC						
Student Lounge	1	1500		1500	UHCL						
Collaborative Spaces	2	2000		4000	UHCL						
Commons Space	1	2000		2000	ONCL						
	1	500		500							
Reception	1	500		500			19,700				
Academic Spaces	4	2000		2000			19,700				
Lab - GIS	1	2000		2000							
Lab - Air Traffic Control lab	1	2000		2000							
Lab - Virtual Airport	1	2500		2500							
Lab - RED BIRD simulation	1	3000		3000							
Classroom - Aviation Management	2	1000	30	2000	SJC						
Classroom -Professional Pilot	2	1000	30	2000	SJC						
Classroom - Air Traffic	2	1000	30	2000	SJC						
Classroom - Drone Education	2	1000	30	2000	SJC						
Classroom - Aircraft Mechanic Program	2	1000	30	2000	SJC						
Executive Office	1	200		200	РМО						
Building Support							5,150				
Electrical Room	2	200		400	Standard						
Mechanical Room	2	200		400	Standard						
Women's RR	1	1200		1200	Code						
Men's RR	1	1200		1200	Code						
MDF	1	500		500							
Storage - large	4	300		1200		with garage dock					
Security	1	100		100							
Building Maintenance	1	150		150							
Total Program SF				40,100							
Circulation (15%)				6,015							
AIR CONDITIONED SPACE				46,115							
Hangar Spaces							35,000				
Storage Hangar	1	20000		20000	WSU Tech	To accommodate 15 Cessnas					
Maintenance Hangar	1	10000		10000		Backshop Labs					
Drone Cage	1	5000		5000	ECU Drone cage						
NON-AIR CONDITIONED SPACE	1	5000		35000	Leo Di Une cage						
GROSS TOTAL				81,115							
				01,113							
Apron Paving	1	20000		20000							

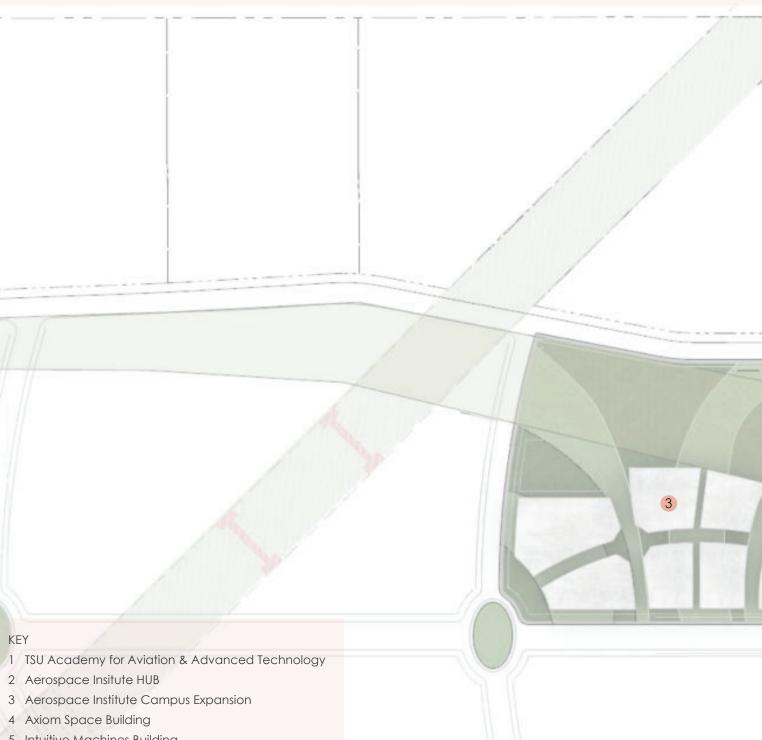
BUILDING DESIGN CONCEPT

Based on the architectural program table, below is a schematic floor plan layout of the spaces required for the TSU Academy. The classrooms, labs, administration, and shared spaces are designed to be in an air-conditioned, single-story building. The two hangar spaces and the drone cage will have direct access to the apron, located adjacent to the airside runway.



PROPOSED MASTER PLAN

F S Group incorporated the proposed TSU Academy for Aviation & Advanced Technology onto the Houston Spaceport Master Plan. Based on conversations with HAS and the academic/industry partners, it was determined that TSU would need airside access to successfully implement their aviation curriculum. F S Group also intends to create a visible connection between the TSU Academy and the Aerospace Institute HUB.



- 5 Intuitive Machines Building
- 6 Collins Aerospace Building
- 7 Airside Runway







09 APPENDIX

CONCEPTUAL DESIGN DRAWINGS

- Programmed Spaces
- Program Table
- Concept
- Spaceport Master Planning
- Aerospace Institute Concept
- Aerospace Institute Masterplan
- Building Design Concept
- Modular Building Expansion
- Proposed Masterplan

MEETING MINUTES

Spaceport Industry + Education Partnership Kickoff Meeting	8/3/2021	100
HAS Shaping Mission Statement Meeting - HAS, FSG	3/23/2022	105
Visioning Session - HAS, SanJac, UHCL	4/13/2022	108
CPET Facility Tour - SanJac, HAS, FSG	5/5/2022	113
TSU Facility Tour - TSU, HAS, FSG	5/17/2022	121
UHCL Campus Tour - UHCL, HAS, FSG	5/20/2022	125
SanJac Design Charrette - SanJac, HAS, FSG	5/24/2022	130
Industry & Educational Partners Meeting with Axiom Space	6/16/2022	137
Axiom, HAS, SanJac, UHCL, FSG		
Industry & Educational Partners Meeting with Intuitive Machines	6/16/2022	142
IM, HAS, SanJac, UHCL, FSG		
Industry & Educational Partners Meeting with Collins Aerospace	6/22/2022	148
Collins, HAS, UHCL, SanJac, FSG		

86

CONCEPTUAL DESIGN DRAWINGS

"Space" represents Infinite preschilities for Non Kund Bygond thine [... as we embast to emplore the Universe] . Simplify of Jay Jones · Clasely of Micis · Spec of dust · Infinity · Infinite Aprice · Radio Wave Mary TT pë Infinity Regular Stopes. Germotric Forms Infinite lossborbiles accuracy in Mature & evoluty is time ! Organne

PROGRAMMED SPACES

Programmed spaces are a group of spaces that enhance and increse the efficiency of workforce training and higher education. These areas range from large multi-purpose spaces and lecture halls to war and conference rooms to facilitate every staff and student requirement.

MULTI-PURPOSE **ADMIN SPACES** • Standard ceiling height with lay-in ceiling system. • High ceiling with lay-in ceiling system. ٠ • Square footage range between 4000 square feet to 4500 square feet. Carpet flooring. ٠ Carpet flooring. Integrate with the HUB's comm/data backbone for maximum information flow. **MEDIA CENTER** • Have projectors with projection screens. • Standard ceiling height with lay-in ceiling system. LECTURE HALL • • High ceiling with lay-in ceiling system. Carpet flooring. • Square footage range between 3000 square feet to 4000 square feet. • Carpet flooring. Have projectors with projection screens. Integrate with the HUB's comm/data backbone for maximum information flow. Enough space for collaboration areas. Have projectors with projection screens. WAR ROOM Descending stepped floor layout. AUDITORIUM Standard ceiling height with lay-in ceiling system. ٠ • High ceiling with lay-in ceiling system. Carpet flooring. • Square footage range between 3000 square feet to 4000 square feet. Carpet flooring. Coffee maker and mini fridge. • Integrate with the HUB's comm/data backbone for maximum information flow. Have projectors with projection screens. Have projectors with projection screens. Raised front stage area. CONFERENCE FACULTY ROOM • Standard ceiling height with lay-in ceiling system. LOUNGE • Standard ceiling height with lay-in ceiling system. ٠ • Square footage range between 2500 square feet to 3000 square feet. Carpet flooring. Carpet / tile flooring. Coffee maker and mini fridge. Enough space for Hoteling and workstations. • Shared areas between academic and industry partners. Have projectors with projection screens. Basic kitchen amenities with hot and cold water supply. STUDENT • Standard ceiling height with lay-in ceiling system. LOUNGE • Square footage range between 2000 square feet to 3000 square feet. Carpet / tile flooring. Computer workstations. • Basic kitchen amenities with hot and cold water supply.

Square footage range between 2500 square feet to 3000 square feet.

Integrate with the HUB's comm/data backbone for maximum information flow.

Square footage range between 1000 square feet to 2000 square feet.

Integrate with the HUB's comm/data backbone for maximum information flow.

War room square footage range between 1200 square feet to 1800 square feet.

Integrate with the HUB's comm/data backbone for maximum information flow.

Conference room square footage range between 200 square feet to 500 square feet.

Integrate with the HUB's comm/data backbone for maximum information flow.

PROGRAM TABLE - AREA ALLOCATION AND PHASING

PHASE I

Room Type	Quantity	Square Feet	No. of People	Total SF	Reference	Notes
San Jacinto College Spaces						47
Admin Suite						
Admin Office	1	190		190	PMO	
Staff Workspace	2	48		96	PMO	
Executive Office	1	190		190	PMO	
UH -Clear Lake Spaces					-	47
Admin Suite						
Admin Office	1	190		190	PMO	
Staff Workspace	2	48		96	PMO	
Executive Office	1	190		190	PMO	
Texas Southern University Space		100		100	1110	47
Admin Suite						······································
Admin Office	1	190		190	PMO	
Staff Workspace	2	48		96	PMO	
Executive Office	1	190		190	PMO	
Rice University Spaces	-	100		100		43
Admin Suite						
Admin Office	1	190		190	PMO	
Staff Workspace	2	48		96	PMO	
Executive Office	1	190		190	PMO	
Shared Spaces						66,50
Lab - Extra Large	2	5400		10800	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors
Lab - Large	2	3500		7000	CPET - SJC	
Lab - Medium	2	1600		3200	CPET - SJC	Exterior access
Lab - Small	4	1000				
Classroom - Medium	2	1500		3000	UHCL	
Classroom - Small	4	900		3600	UHCL	
Conference Room	2	1400	25	2800	PMO	
Media Center/ Library	1	3600		3600	UHCL	
Faculty Lounge (shared)	1	3000		3000	CPET - SJC	
Student Lounge (shared)	1	3000		3000	UHCL	
Collaborative Spaces	4	2000		8000	UHCL	
Lecture Hall	2	2400		4800	UHCL	
Multipurpose Room/ Auditorium	1	4200		4200	PMO	
Cafeteria/Commercial Kitchen	1	3000		3000		
Commons Space	1	2000		2000		
Exhibition Space	1	500		500		
Demonstration Space	1	500		500		
Reception	1	500		500		
Vendor Space	4	750		3000		
Building Support	2	200		400	Ctandard	6,10
Electrical Room					Standard	
Mechanical Room Fire Riser	2	200 150		400 150	Standard Code	
Fire Riser Women's RR	1	1200		1200	Code	
Men's RR	1	1200		1200	Code	
Elevator	4	1200		400	Code	
Freight Elevator	2	200		400	coue	
Freight Elevator MDF	2	500		400 500		
Storage - large	4	300		1200		with garage dock
Scorage - large Security	4	100		1200		with galage uptk
Building Maintenance	1	150		150		
Sanang Maintenance	1	100		150		
Total Program SF				74,504		
Circulation (25%)				18,626		
TOTAL				93,130		

The program for the Aerospace Institute has been consolidated into these tables and divided into four phases. The first phase will include all the core functions for the institute along with labs and classrooms. The additional three phases will expand in a modular fashion.

PHASE I	93,130 SF
PHASE II	+ 27,105 SF
PHASE III	+ 65,585 SF
PHASE IV	+ 65,585 SF
TOTAL PROGR	AMMATIC SPACE FOR ALL PHASES: 251,405 SF

PHASE II

Room Type	Quantity	Square Feet	No. of People	Total SF	Reference	Notes	
Shared Spaces							17,00
Lab - Large	2	3500		7000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Medium	2	1600		3200	CPET - SJC	Exterior access	
Lab - Small	2	1000		2000			
Classroom - Medium	2	1500		3000	UHCL		
Classroom - Small	2	900		1800	UHCL		
Building Support							3,8
Electrical Room	1	200		200	Standard		
Mechanical Room	1	200		200	Standard		
Women's RR	1	600		600	Code		
Men's RR	1	600		600	Code		
Elevator	1	100		100	Code		
Freight Elevator	1	200		200			
MDF	1	500		500			
Storage - large	4	300		1200		with garage dock	
Security	1	100		100			
Building Maintenance	1	150		150			
Total Program SF				20,850			
Circulation (30%)				6,255			
TOTAL				27,105			

Shared Spaces						45,000
Lab - Extra Large	2	3500	7000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Large	4	3500	14000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Medium	4	1600	6400	CPET - SJC	Exterior access	
Lab - Small	8	1000	8000			
Classroom - Medium	4	1500	6000	UHCL		
Classroom - Small	4	900	3600	UHCL		
Building Support						5,450
Electrical Room	1	200	200	Standard		
Mechanical Room	1	200	200	Standard		
Women's RR	1	900	900	Code		
Men's RR	2	900	1800	Code		
Elevator	2	100	200	Code		
Freight Elevator	1	200	200			
MDF	1	500	500			
Storage - large	4	300	1200		with garage dock	
Security	1	100	100			
Ruilding Maintenance	1	150	150			

Shared Spaces						45,00
Lab - Extra Large	2	3500	7000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Large	4	3500	14000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
Lab - Medium	4	1600	6400	CPET - SJC	Exterior access	
Lab - Small	8	1000	8000			
Classroom - Medium	4	1500	6000	UHCL		
Classroom - Small	4	900	3600	UHCL		
Building Support						5,45
Electrical Room	1	200	200	Standard		
Mechanical Room	1	200	200	Standard		
Women's RR	1	900	900	Code		
Men's RR	2	900	1800	Code		
Elevator	2	100	200	Code		
Freight Elevator	1	200	200			
MDF	1	500	500			
Storage - large	4	300	1200		with garage dock	
Security	1	100	100			
Building Maintenance	1	150	150			
Total Program SF			50,450			
Circulation (30%)			15,135			

65,585

PHASE IV

TOTAL

					45,000
2	3500	7000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
4	3500	14000	CPET - SJC	Hi-Bay with cranes, loading dock access and high roll-up doors	
4	1600	6400	CPET - SJC	Exterior access	
8	1000	8000			
4	1500	6000	UHCL		
4	900	3600	UHCL		
					5,450
1	200	200	Standard		
1	200	200	Standard		
1	900	900	Code		
2	900	1800	Code		
2	100	200	Code		
1	200	200			
1	500	500			
4	300	1200		with garage dock	
1	100	100			
1	150	150			
		50,450			
		15,135			
	4 4 8 4 4 1 1 1 2 2 2 1 1 4 1	4 3500 4 1600 8 1000 4 1500 4 900 - - 1 200 1 900 2 900 2 100 1 200 1 200 1 500 4 300 1 100	4 3500 14000 4 1600 6400 8 1000 8000 4 1500 6000 4 900 3600	4 3500 14000 CPET - SIC 4 1600 6400 CPET - SIC 8 1000 8000 4 4 1500 6000 UHCL 4 900 3600 UHCL 7 200 Standard 1 200 200 Standard 1 900 900 Code 2 900 1800 Code 2 900 200 Code 1 200 200 Code 2 900 1800 Code 1 500 500 4 300 1200 100 100 1 100 100 100 1 150 150 50,450	4 3500 14000 CPET - SIC Hi-Bay with cranes, loading dock access and high roll-up doors 4 1600 6400 CPET - SIC Exterior access 8 1000 8000 Hi-Bay with cranes, loading dock access and high roll-up doors 4 1500 6000 UHCL 4 900 3600 UHCL 7 200 200 Standard 1 200 200 Standard 1 900 900 Code 2 900 1800 Code 1 200 200 Standard 1 900 900 Code 2 900 1800 Code 1 200 200 Standard 1 200 200 Code 1 500 500 with garage dock 1 100 100 100 1 150 150 50,450

CONCEPT

RESEARCH

As the HAS Aerospace Institue begins to develop, it is imperative to have an underlying design concept that informs future development and architecture on and around the site. This will ensure the cohesive nature of potential future expansion.

Being a center for space exploration, the Aerospace Institute at the Houston Spaceport Masterplan Concept derives from the essence of space. "Space" itself is rather vague and ambiguous but it can be described with one word: **INFINITY**.

Infinite space. Infinite opportunities. Infinite possibilities.

"Space" represents infinite possibilities for mankind as we embark to explore the Universe. Since 1958, the year NASA was established, mankind has made impressionable footprints in Space. From sending the first people to the Moon, to developing the International Space Station, the opportunities of exploration in space are endless. The Houston Spaceport aspires to be the grounds of great space discoveries for the future.

One example of recent discoveries is the character of black holes.

"Black Holes are where God decided to divide by 0." - Albert Einstein

Dividing by zero equals infinity. Blackholes only emit Radio Waves and X-rays. These cannot be seen with the human eye.

Radio Waves are the primary mode for communication in Space.

Sound cannot travel in space because there are not molecules close enough together to transmit sound between them.

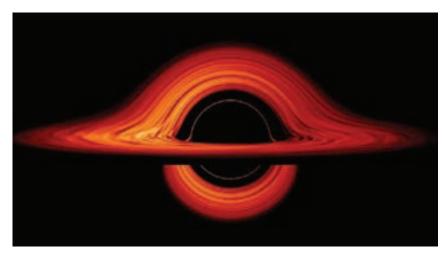


Figure 6.1 Visualization of black hole provided by NASA illustrates how its extreme gravity can distort light

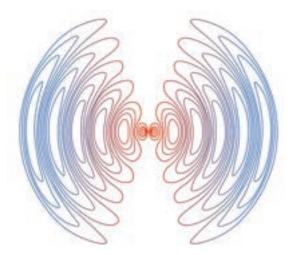
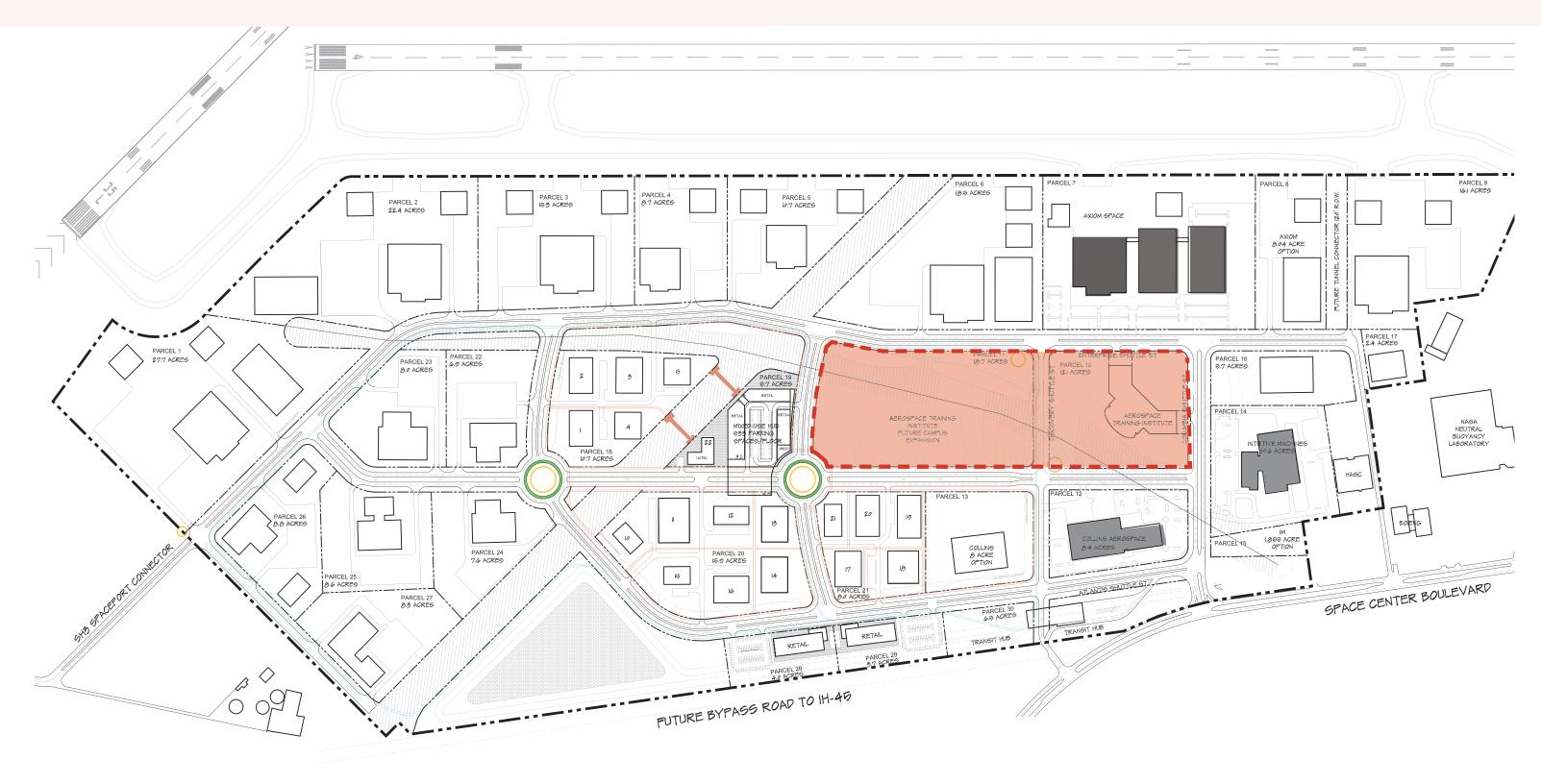


Figure 6.2 Illustration showing the electric field lines of half-wave dipole antenna radiating radio waves

09

SPACEPORT MASTER PLANNING

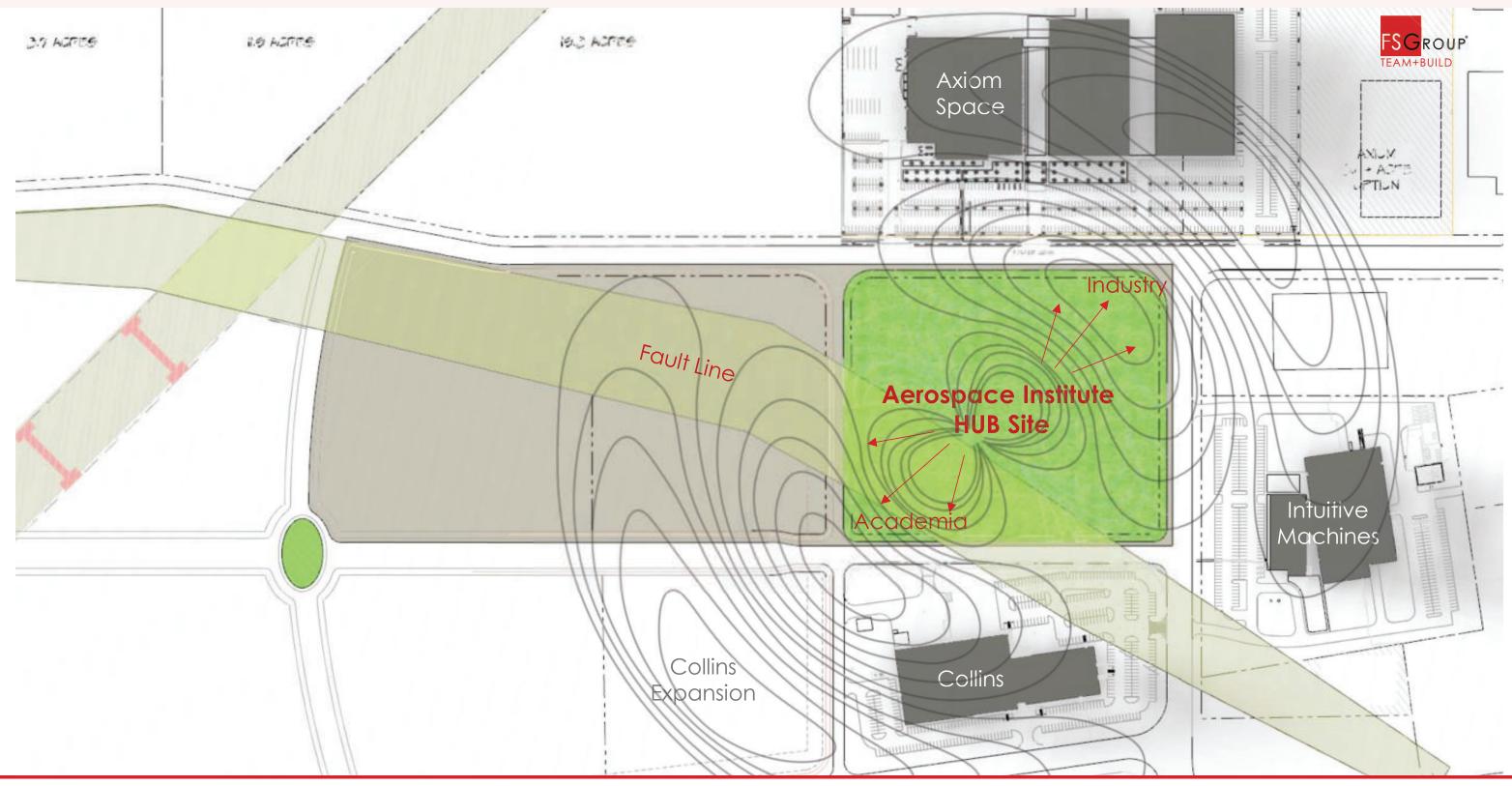
F S Group Architects, along with Jacobs Engineering, developed a land use plan for the 400+ acres of the Houston Spaceport in which parcels and site work were defined. The area shaded in pink (roughly 35 acres) has been designated as the site for the Aerospace Institute campus. The rest of the site has been allocated for aerospace industry partners, commercial and retail space, green parks, and parking.



09

AEROSPACE INSTITUTE CONCEPT

In order to develop a cohesive campus, F S Group Architects incorporated the **design concept of bipolar** radio waves on the Houston Spaceport Masterplan to better inform the essence of the campus. The central point of the radio waves have been placed at the center of the proposed HUB site and is aligned with the existing geological fault line. The emanating radio waves from this point travel towards the existing industry partners.



09

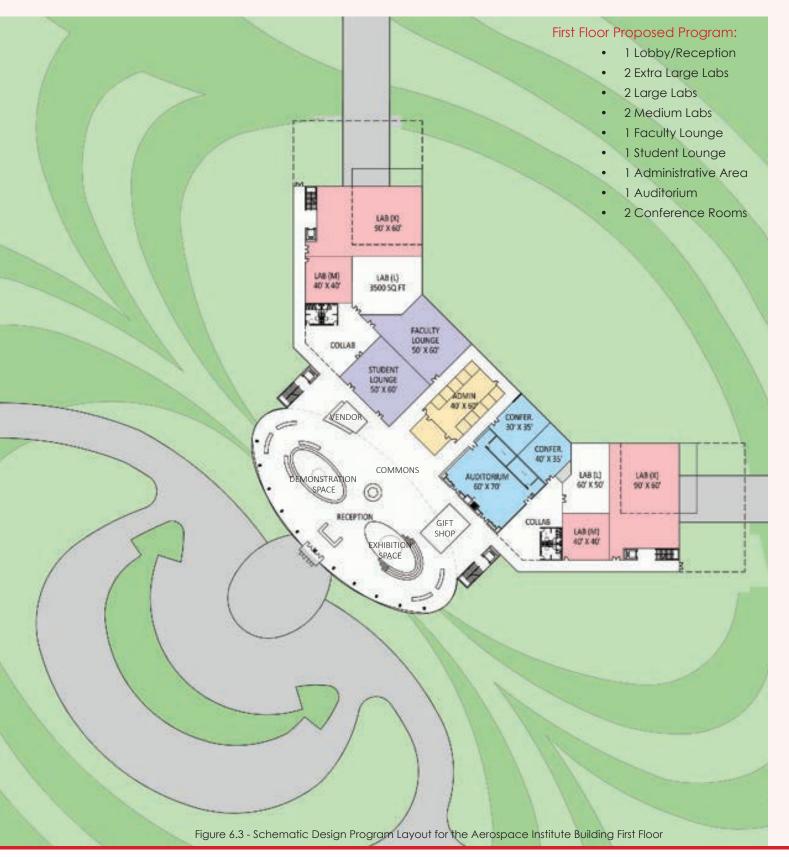
AEROSPACE INSTITUTE MASTERPLAN

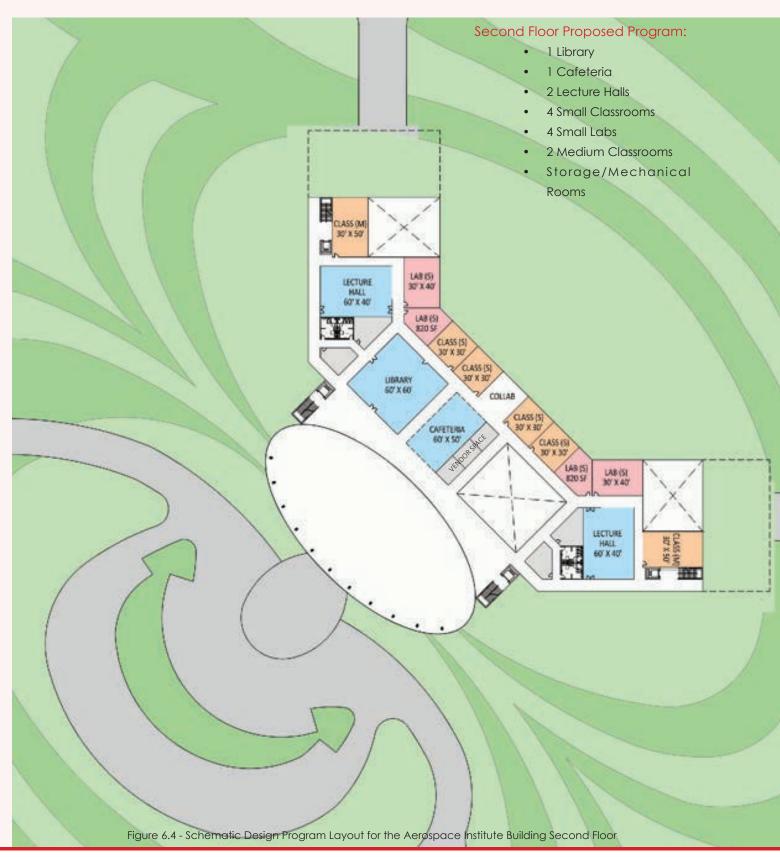
F S Group developed the Masterplan below based on the square footages from the program for the Aerospace Institute HUB. Based on conversations with HAS and the academic/industry partners, the Aerospace Institute can foresee future expansion based on research/training requirements in the industry as they are being quickly developed.



BUILDING DESIGN CONCEPT

Based on the conversations with industry partners and institutions, FSG proposed several schematic layouts for the program to accommodate the needs the Aerospace Institute. Below is a diagram of one of the schemes which shows flexibility in future expansion.





MODULAR BUILDING EXPANSION

Phase I

Building Footprint 59,000 SF

Total SF 93,130 SF



88,500 SQ FT 70,000 SQ FT

Phase II

Expansion SF 27,105 SF

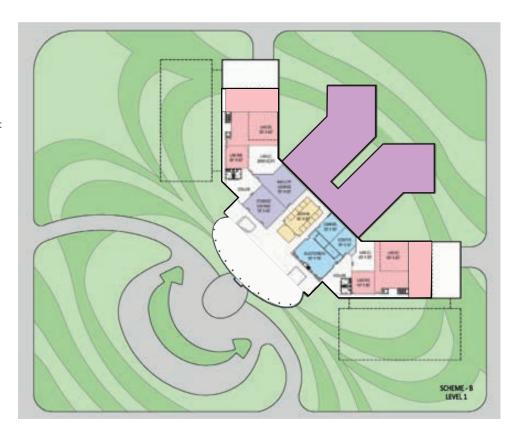
Cumulative Total SF 120,235 SF



Phase III

Expansion SF 65,585 SF

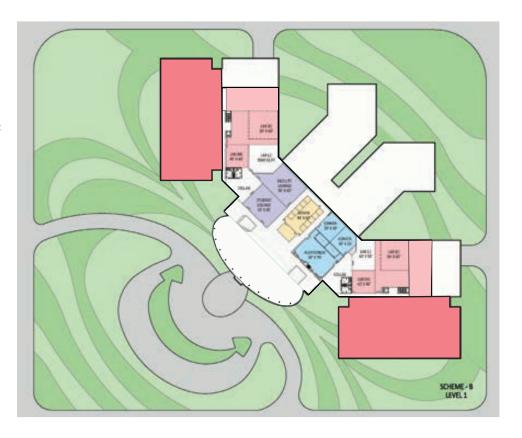
Cumulative Total SF 185,820 SF



Phase IV

Expansion SF 65,585 SF

Cumulative Total SF 251,405 SF



APPENDIX AUGUST 1, 2022

09

PROPOSED MASTERPLAN



APPENDIX AUGUST 1, 2022









MEETING MINUTES

"Space" represents Infinite preschilities for Non Kund Bygond thine [... as we embast to emplore the Universe] . Simplify of Jay Jones · Clasely of Micis · Spec of dust · Infinity · Infinite Aprice · Radio Wave Mary TT pë Infinity Regular Stopes. Germotric Forms Infinite lossborbiles accuracy in Mature & evoluty is time ! Organne



SPACEPORT KICK OFF - 08/03/2021

Spaceport Industry + Education Partnership Meeting

Th. 1 - Partnership

Big Goals, Limited Budget			
Talent Supply Chain			
Touch Labor			
Training/ Dev. Aero Techs			
Hands-on, Certificates			
Internships			
Job Offers			
15 Universities – Partnerships			
Co-locate w/ Industry			
Testing, Receiving Inspection			
Commercialization			
Training; Tech Supply for talent – Demographic limits (STEM)			
Plant Relocation (Windsor locks to Spaceport Houston)			
Talent needed for Mfg, Assy; Incubator Space			
Unique Capabilities Required; Certificates; new techs and engineers			
Mentorships			
Talent Growth for Apprenticeship Program			
Ecosystem – holistic solutions			
Intern Hires – to – permanent (3-month internship)			
Commercialization			
R&D			

HOUSTON AIPORT SYSTEM AEROSPACE INSTITUTE

Th. 2 & 3 – Needs

IM:	Proximity to Industry where work is being done w/ workforce training; faculty; students		
	Bridge gap: on-campus to work location		
<u>SAIC:</u>	Capstone Project – solve a real problem		
	Remotely and locally		
	Integrate and work as a team		
	Applying Knowledge		
Collins:	Unique, sometimes hazardous materials		
	Unique, sometimes hazardous techniques		
	Replicate capabilities from prior location		
Bastion:	Fellowship Program w/ Universities, Students		
	Attitude = Key		
	Real Projects		
	Collaboration		
	Always need specific talent		
Th. 4 – Value Added			
<u>IM:</u>	Placement of talent via co-location		

Comingling of Co's, Instructors, Students = Powerful Dynamic

SAIC: Builds Area, Industry Resilience

Regional Competitiveness ____ Multi-Discipline

National Competitiveness

– Multi-Discipline + Multi-Industry

Prepare for the future; vision

Collins:Co's can capitalize on a working system for talent development (SJC model)Co-location creates extra capabilitiesSpaceport, Edge Center

<u>Bastion:</u> Networking; Relationships Needs vs Capabilities – Meet

Th. 5 – Mechanisms (Industry-Education Partnership)

<u>Rice:</u>	Range of Needs to fill gas
	 Workforce Development Professional Development Recruitment R & D
	Relevant Offerings vs Industry Needs
	Collaboration to Build Foundation
<u>SAIC:</u>	Points of Contact
	Consortium to leverage
	Transformation in Space
	 Cheaper/ faster business models Bold action required Disruption Houston needs to be the epicenter
<u>BAHEP:</u>	Recruiting New Business into Area – especially Aerospace & Aviation
	Talent availability is defining factor
	Possible global Center of Excellence
<u>I.M.:</u>	Aero & Defense – unprecedented demand
	Civil & Commercial

Spaceforce

Scarce Resources – collaboration builds expertise

Bastion:	Distribution Network
	Bridge to talent development & placement

<u>Collins:</u> Opportunities drive investment Growth through partnership

<u>Barrios:</u> Small business needs Talent ready to work without remedial training Economic advantage to immediately contribute

<u>Rice:</u> Partnerships work both ways Academia needs help of industry for research grants

Amazon Web Services:

Technology Infusion Vision Innovation

One Big Thing:

Bastion:	The Best is Yet to Be
SAIC:	Regional Engagement, Partnership
	Take Risk for Reward
<u>I.M.:</u>	Center-of-Excellence Opportunity
	Preserve for the Nation (e.g. SuperCollider Loss hurt)
	Space City – Put us All Together & Great Things Happen

<u>Collins:</u> Commercial Space Growing

Less NASA-centric

Tipping Point Opportunity to Lead (take advantage)

Ellington Airport . Houston Texas | 23 March 2022



MEETING TOPIC:	Shaping Mission Statement	ORGANIZER:	Houston Airport System (HAS)
MEETING DATE:	23 March 2022 at 11:00 am	MINUTES DATE:	28 March 2022
LOCATION:	Director s Lounge Conference Room	AUTHOR:	F Sabir, FSG

- Project Status / Updates
 - [HAS Arturo M] Provided status on the approval of the proposal for the Programming of the Aerospace Institute.
 - [FSG] Provided status on the Letter of Authorization (LOA), which can be finalized as a result of decisions from this meeting.
- > How will the Educational Institutions Participate with the Aerospace Institute?
 - [HAS Mario D] No lease will be offered; HAS will not be acting as a landlord.
 - Educational Institutions will receive land where they can build their own facility.
- How will the Aerospace Institute be Funded?
 - [HAS Jim S] HAS is not an educational institution so it cannot provide direct funding for the development of the Aerospace Institute Spaceport.
 - [HAS Jarret S] Funding for Educational Institutes is generally provided by the Federal Department of Education.
 - Airport funding is provided by Federal Aviation Administration
 - [HAS Mario D] An entity (comprised of the Educational Institutions) may organize to fund and develop the Aerospace Institute.
- > Programming Process for the Aerospace Institute Spaceport
 - [HAS Mario D] HAS is working on a Program and Concept Design document that can guide future participants on the value of engaging with the Aerospace Institute Spaceport
 - [HAS Jarret S] All educational institutes within the greater Houston area should be invited to participate in the programming process.
 - [HAS Arturo M] Initial meetings should be limited to the schools that have signed a *Memorandum of Understanding* (MOU)
 - San Jacinto College
 - University of Houston
 - [HAS Mario D] An academic class course on forms of training will be created and offered by
 - San Jacinto College
 - University of Houston
 - Texas Southern University

Ellington Airport . Houston Texas | 23 March 2022



- [FSG] San Jacinto College will move current lease from the Edge Center to the Aerospace Institute.
- [HAS Mario D] Suggested allocated spaces:
 - Space for a hanger adjacent to the airside
 - Conference and Training: 25,000 SF
 - Educational Institute: 25,000 SF per institute
- [HAS Mario D] Allocated space for Educational Institutions with signed MOU:
 - San Jacinto College: 50,000 SF
 - University of Houston: 50,000 SF
- > Characteristics of the Aerospace Institute Spaceport
 - [HAS Mario D] Envisioned as a centrally located hub for education, research and innovation o This hub will be a collaboration center, closely surrounded by Space Industry Manufacturing
 - companies such as: Axiom, Collins, Intuitive Machines and others
 - Classrooms and Lab Rooms will be fully equipped to for specialized training
 - o Commons space a casual space where people can meet over coffee
- Future Meetings
 - [HAS Mario D] Week of April 4th meet with the heads of the partner institutions.
 - [HAS Arturo M] Will contact the heads of these institutions for the next meeting
 San Jacinto College
 - University of Houston at Clear Lake
 - Texas Southern University (TSU)
 - Meeting location: Lone Star Museum at Ellington Field Airport
- Meeting Attended By:
 - Houston Airport System (HAS)
 - Mario Diaz, Director of Houston Airport System
 - o Jim Szczesniak, Chief Operating Officer
 - Arturo Machuca, General Manager of Ellington Airport
 - o Jarrett Simmons, Chief Development Officer Infrastructure
 - o Charlene Reynolds, Chief Commercial Officer
 - FS Group Architects (FSG)
 - F Sabir, FSG Principal

09



Ellington Airport, Houston Texas

MEETING TOPIC: Visioning Session – HAS and Academic Institutions

ORGANIZER: Houston Airport Systems

DATE: April 13th, 2022

LOCATION: Lone Star Flight Museum Board Room

AUTHOR: Sabir, FSG

- Meeting Attendees:
 - Houston Airport System (HAS)
 - o Mario Diaz, Aviation Director, Houston Airport System
 - o Jim Szczesniak, COO, Houston Airport System
 - Arturo Machuca, Director Ellington Field Airport & Houston Spaceport
 - o Jarrett Simmons, Chief Development Officer, Houston Airport System
 - o David Robbins, Director, Program Delivery and Controls, Houston Airport System
 - o Susan Keil, AIA, Design Manager, Houston Airports
 - Jeffrey Tennyson, Senior Project Manager, Houston Airports
 - o Dr. Brenda Hellyer, Chancellor, San Jacinto Community College
 - o Dr. Allatia Harris, Vice Chancellor, San Jacinto Community College
 - o Teri Crawford, Vice Chancellor External Relations, San Jacinto Community College
 - o Dr. Richard Walker, President, UHCL
 - o Dr. Chris Maynard, Interim Vice President, UHCL
 - FS Group Architects (FSG)
 - F Sabir, FSG Principal
- > Project Status / Updates
 - Presented by Sabir in the PowerPoint Presentation
- Meeting Format
 - 1. Introductions by Arturo Machuca about the Aerospace Project. (See attached PP presentation for summary of assumptions.)
 - 2. Opening Remarks by Mario Diaz about the vision of the project. (See attached PP presentation for summary of HAS Vision.)
 - 3. HAS & Academia Joint Visioning Session Presentation was shared by Sabir. (See attached PP presentation for Project Vision & Concept.)
 - 4. The basis of Design is WSU Tech. (See attached PP presentation for Basis of Design Campus of WSU Tech Wichita, Kansas. Plans & Photographs from the tour.
 - 5. Houston is 10 times the size and also much larger contributing Industry & Academia & Government partners.
 - 6. Ground Floor Discussion about the Aerospace Industry in Houston, Texas.
 - 7. 10 years look ahead. Mario wants this to meet the needs for up to 10 years, to include new educational partners, new aerospace companies and governmental institutions and develop a

workforce training program to facilitate the aerospace industry.

- 8. Examples of already providing context:
 - a. San Jacinto- Opened EDGE 2020- will be moving EDGE to this facility
 - b. University of Houston Clear Lake has an LOI with San Jac to develop the aerospace workforce development programs at the Spaceport.
- 9. Mario envisioned a central HUB in the midst of the Aerospace Industry Buildings to provide Facilities for Aerospace Workforce Training as well as become a location for Industry & Government Collaboration:
 - a. Central
 - b. Collaboration
 - c. develop workforce training.
 - d. Stimulate the Aerospace Industry in Houston
 - e. Surrounded by Industry Partners at Spaceport such as Collins, Axiom Space & Intuitive machines.
 - f. Access to Airside on the Ellington Field Airport.
- 10. Various types of Industrial Training & Education Space centrally located at the spacceport.
- 11. Onsite Industry Presence at the Spaceport and direct Airside Access is very beneficial.
- 12. Proposed site location for the Aerospace Institute:
 - a. Preferably Located centrally on the Spaceport
 - b. Expansion to west where there is land and the detention areas.
- 13. Mario: Evolutionary process of education The specialized welding programs required for the Aerospace Industry & the 3D Printing and Instrument Panel Training can lead to the Designing & Manufacturing of Aerospace Machines rig these at the Spaceport inn the Future as the programs evolve.
 - a. Aerospace Handwork- precision welding (training opportunity).
 - b. Aerospace Computer programming work
 - c. Next step then would lead up to designing the machines
- 14. Transition in Manufacturing is occurring it used to be casting now becomes 3D printing technology.
- 15. Primary Goal is to provide qualified students (certificate). Workforce Training for the Aerospace Institute.
- 16. Material properties / Material Science Courses
- 17. Collins Space Suits manufacturing unit located at the Spaceport will require Health and Human Services collaboration and training and testing.
- 18. Intuitive Machines is building a Lunar Lander at the Spaceport, will require NASA collaboration testing and testing.
- 19. San Jacinto EDGE Training 60 students for Bay HUB. Half have grants. Internships are built into study.
 - a. Aerospace Tech
 - b. Composites
 - c. Electrical
 - d. Manufacturing
- 20. Craig Hall_Raytheon
- 21. San Jac & UHCL are conducting surveys that will be available soon to ascertain what the Industry requirements are and how to move forward with the workforce training programs.
- 22. 189 technicians are being trained at the San Jac Edge Center. The remainder are engineers and HR.
- 23. Collins 120 Technician training is required
- 24. Intuitive Machines currently has Workforce training with San Jacinto and they may have additional needs. A past crop of students are now working with Intuitive Machines.
- 25. \$585,000 EVA Grant Congressional Community Project. Will be used for Equipment costs
- 26. Survey by Academic Institutions being done with Industry to understand their needs in 5 to



10 years

- 27. Idea is to work with the proposed programs and the # students and map out functionns to address the facility requirements:
 - a. Offices required
 - b. Training rooms
 - c. Classrooms
 - d. Commons
 - e. Breakrooms
 - f. Large High Bay Labs
 - g. Large Testing Areas
- 28. Business Case- HAS will front the bill to define the PDM Project Definition manual with the Stakeholders where future development and costs can begin to be discussed.
- 29. For this phase An approx. 100,000 sf facility is proposed, \$30MM envisioned, 500 students. In 2 to 3 years
- 30. This initial study to be followed by a more comprehensive Package (level of Design Development).
- 31. Space Requirements discussed:
 - a. San Jac 1/2 online. A computer lab is available.
 - b. Second 1/2 is hands on inn training labs
 - c. Final Phase Internship at the Industry located on the Spaceport
 - d. Flexible Training Programs currently the training adapts to the needs of the Industry and their requirements
 - e. Multiple Entry and Exit points in the education in the system for students.
 - f. Maybe not duplicate the functions down the street (traditional welding), but maybe offer a small number of Aerospace Grade Exotic Welding requiring specialized facilities.
- 32. HISD also will be present at the HUB; students visiting to get exposed to some of the 'Space Careers'.
- 33. Day Courses (recent high school grads) and Evening courses (career change-or additional certification courses)
- 34. Various stakeholders Academic Institutions & even Industry will be co-located in one Central Facility for Training, Collaboration and Innovation.
- 35. Tour San Jac Petro Chem Training Facility By Industry for Industry
 - a. Day in the life of an operator
 - b. Collaboration Safety
 - c. How do you expand for this Industry here at Aerospace Institute?
- 36. San Jac- Electrical and Electronics training at the PetroChem existing facility is a good example, but it is operated by fully accredited instructors.
 - a. Industry wants some features. They want students to be familiar with 'turn arounds'.
 - b. Glycol unit was provided outside because industry demanded it that way for training.
 - c. Overhead for a fully staffed Training Institute should be evaluated.
 - d. Training Programs can grows from non-credit which reaches a point and then it can be switched to accredited program.
 - e. Different from a traditional 'credit' education.
 - f. Coast Guard to support Industry Needs Maritime Campus (45,000 sf 13 Acres) is a good example.
 - g. Instrumentation Labs are 'modular'.
 - h. San Jac engages industry partners all the time and engage with industry for planning. Example: Faculty required design or Industry led design? San Jac chose to go with the Industry led design. Example: A Glycol unit which professors asked to be in an air conditioned facility was ultimately built out of doors (where it is located in an industrial setting). Facility needs to match what the student will find at the industrial property.



- 37. U of H- Applied programs Grant and sub awards are a way to create the required programs for the industry demands.
- 38. This Aerospace Institute HUB idea is being discussed with the Academic Institutions to develop a Central HUB for Aerospace Technical institute that can provide the manpower to work for Aerospace Companies headed to space & are located at the Houston Spaceport.
 - This technical workforce would come from the Aerospace Institute. The institute will base its curriculum on what the Aerospace Companies want and need.
 - All courses and instructors will meet the requirements of the Aerospace Companies
 - The program should be flexible to provide students who can work in any capacity within the Aerospace Industries
 - The building has to be **flexible** also to accommodate the students and the programs that will facilitate the aerospace industries
 - Collaboration with the companies and the universities will result in a successful program. The needs of the industry will drive the program which will require a flexible building (as needs change, the building changes)
 - Potential students can go to school and also get hands on training by interning with the aerospace companies.
 - The design must come from the requirements of the industries that will use it. Without input from the experts
 - We will get input from the schools and aerospace industry partners
 - Space in the facility should be for R and D for the industry partners
 - We'll get input from the industry partners. Put them in contact with the educational partners.
 - Let's not forget NASA is down the street. They can pop in, contribute to the program, make an appearance so the students can see who they may work for in the future
 - Provide common spaces so all elements of the aerospace industry can utilize, give seminars, have brainstorming sessions etc.
- Meetings to Date
 - March 22nd meet with HAS Executive Leadership team for HAS visioning
 - April 13th meet with HAS Executive leadership and UHCL and San Jac executive leadership team for joint visioning session
- Future Meetings

Academic Institution Meetings:

- 1) Edge Center Tour Meeting with Program Directors & other stake holder responsible for growth of the program.
- 2) San Jac Petro Chem, Glycol Facility
- 3) Maritime Campus
- 4) Vice Chancellor Meeting to recap the information gathered.
- 5) UHCL VP Meeting with Program Directors and then stake holder meeting.
- 6) Facilitate University of Houston & San Jacinto Vice Chancellor level meeting to discuss the course work coordination.
- 7) Facilitate additional Institutions such as Texas Southern University & Lone Star College System and other such academic institutions.

Industry Meetings:

- 1) Intuitive machines Meeting to discuss their workforce development & conferencing & collaboration needs.
- 2) Collins Meeting to discuss their workforce development & conferencing & collaboration needs.



- 3) Axion Space Meeting to discuss their workforce development & conferencing & collaboration needs.
- 4) San Jacinto & UHCL Vice Chancellor & VP meeting with the Aerospace Industry Leaders
- 5) San Jacinto & UHCL Program Director meeting with the Aerospace Industry stakeholder for workforce development.

FSG - HAS Meetings:

- 1) Biweekly Status Update Meetings
- 2) Confirm Project Process, Project Schedule & Project Team & Project Stake Holders.
- 3) To discuss the schedule of deliverables and prepare an in-progress deliverable schedule
- 4) To help set up milestones and track the milestones to achieve the goals.
- 5) To discuss meetings Management Protocols.

All Team Collaborative Programming Charette

San Jacinto College Central Campus Tour Pasadena, Texas 77057



MEETING TOPIC:	San Jacinto College Central Campus: CPET Facility Tour	ORGANIZER:	Dr. Sarah Janes / Valerie Bugayong
MEETING DATE: LOCATION:	05 May 2022 at 8:00 AM – 9:00 AM 7901 Fairmont Parkway Pasadena, TX 77057	MINUTES DATE: AUTHOR:	17 May 2022 April Janiszak, FSG

* Meeting Attended by:

- FS Group
 - o Sabir, F
 - Harry Knapp
 - Valerie Bugayong
 - o Zain Koita
 - o Rukaiya Jamali
 - o April Janiszak
- Houston Airports System
 - o Susan Keil
- San Jacinto College
 - o Dr. Sarah Janes
 - o Allatia Harris
 - o Jeffrey Pearce
 - Flor Escatel
 - Kelly Groaning

Introduction:

- Dr. Sarah Janes at San Jacinto College hosted a tour of the LyondellBasell Center for Petrochemical, Energy, & Technology (CPET). In attendance were Susan Keil from HAS, and the design team from FS Group Architects.
- The purpose of this meeting was to document the existing laboratories and classrooms to help with possible implementation at the Spaceport.
- Listed below are summaries of the tour sections with photos.



✤ SJC | CPET Tour | Common Area

- The main lobby at entrance is a large 2 level open space that is designed to be flexible, including moveable partitions depending on the event at the time.
- Common conference room is adjacent to the main lobby for easy access.
- Corridors are large in width which also showcases numerous graphics pertaining to the industry, as well as words of encouragement.
 - Several areas with café type seating to break away for lunch or rest in between classes.
 - SEE COMMON AREA PHOTOS BELOW



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SJC | CPET Tour | Regular Classrooms

- Classrooms are along the inner portion of the 1st & 2nd levels. •
- All classrooms have short throw projectors ٠
- Typical ceiling height is approximately 9'-0" 10'-0" ٠
- Power poles drop from ceiling next to student's classroom tables in order to access electricity for • electronics.
 - SEE REGULAR CLASSROOM PHOTOS BELOW \geq



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San Jacinto College Central Campus Tour Pasadena, Texas 77057



SJC | CPET Tour | Classroom Lab

- All classrooms have short throw projectors.
- Safety precautions/equipment are prominent (i.e., eye wash, ear plugs, OSHA safety shower, etc.)
- Special Labs have large overhead doors that open to outdoor courtyard.
- Sound insulation problems in multi-purpose labs.
- Extensive electrical capabilities, mostly coming down into labs from ceiling.
- Staff specific labs.
- UV activated penetrants in some labs require window black outs.
- Majority of equipment are on casters to allow for maximum flexibility throughout the space as needed.
- Commercial & Industrial electrical labs provide troubleshooting teachings.
- College provides faculty training.
- Outdoor mini mock-up in courtyard for training.
- Maintenance basics performed by students.
- •
- > SEE CLASSROOM LAB PHOTOS BELOW



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Texas Southern University – L.H.O. Spearman Technology Building Tour 3100 Cleburne Street Houston, TX 77004



MEETING TOPIC: Tour + Meeting of the L.H.O. Spearman Technology Building at TSU

ORGANIZER: Harry Knapp, FSG

MEETING DATE: 17 May 2022 at 1:00 PM – 4:30 PM LOCATION: 3100 Cleburne Street Houston, TX 77004 MINUTES DATE: 19 May 2022 AUTHOR: April Janiszak, FSG

* Meeting Attended by:

- <u>Texas Southern University</u>
 O Dr. Terence Fontaine
- <u>Houston Airports System</u>
 Susan Keil
- FS Group
 - o Sabir, F
 - Harry Knapp
 - Zain Koita
 - Mustafa Zakir
 - April Janiszak

Meeting Format:

- Sabir: Introduces Concept of Academic Visioning
- Dr. Fontaine: Speaks about general aviation, aviation training, & management
- Mario's Plan:
 - To create a 'HUB' at the Spaceport
- Terence Fontaine: Aviation vs. Space
- Vanessa Wyche Director of Johnson Space Center
- Missing link? NASA involvement
 - o Opportunities to new STEM Learning
- TSU possible space needs:
 - Airside access
 - Maintenance: increasing need now / near future
 - Hangar space for aviation Maintenance School
 - a) 250,000 SF of hangar space needed + Back Shops (fabrication of space parts & storage, rigging, etc.)
 - b) Plane will have safe refuge and be out of the elements.
 - o Back Shops: Equipment, Fabrication, Repairs
 - Generic but specialized to manufacturing processes to be used by students in the future.
 - $_{\odot}$ 4 classroom spaces + 4 equal lab space ~ roughly 20-22 students each.

Texas Southern University – L.H.O. Spearman Technology Building Tour 3100 Cleburne Street Houston, TX 77004



- [T.F.]: "You want to train your own".
- One item missing: Maintenance Mechanics (which has excess overtime).
- Rice Aviation no longer exists.
- Back Shops include the following:
 - ∘ Engine
 - Fabrication
 - o Generator
- TSU & SWA Partnership for Revenue Management Incorporate SWA ways of doing things into coursework to help younger adults get jobs.
- Is it possible for generic students to take individual courses to develop their own career paths?
 - San Jac Welding Course
 - o TSU Engine Maintenance Course
- San Jacinto & TSU Drone Programs
 - Charettes to note overlapping programs & identify.
- [T.F.]: MOU exists between TSU, San Jacinto, & UHCL
- [T.F.]: \$21K per Air Force student revenue.
- Number of students in Aviation Program > 6:1 ratio (students : airplanes)
- Revenue opportunities inside building could include the following:
 - o Coffee
 - Restaurant vendors
- Schedule: Set up Industry partner meetings & charettes in the next 2-3 weeks.
- [T.F.]: Board of Lonestar Flight Museum.
- [T.F.]: Possible COH Bond.
- Similar to WSU Bond.
- [S.K.]: Axiom asks for 1,000 people for training this year & 1,500 for the following year.
- Students pay for Hangar Space @ Ellington, Fuel, & Insurance.
- AMP Program needed for the Back Shop @ new future TSU hangar.
- Infrastructure for future programs @ new hangar.
- <u>3 Degree Programs:</u>
 - o Science
 - o Aviation
 - o Management

Concentration:

- Management
- Professional Pilot
- UAV Drones (Unmanned Aviation Vehicles)
- Propeller testing & parameters > tolerance = testing for pressure
- RAM Team: Rapid Access Maintenance
- Airlines have their schools interested in manufacturing. Create a space for licensing & certificates
- Layout Efficiencies
- Training vs. Higher Education
- [T.F.] Quote: "Training Your Own"

Texas Southern University – L.H.O. Spearman Technology Building Tour 3100 Cleburne Street Houston, TX 77004



- Terence is to try and set up a meeting with Vanessa Wyche (Director of NASA's Johnson Space Center) with FS Group Design Team and HAS.
- Although different Institutions will be intertwined in the same space, there should be a working collaboration since everyone is on the "same mission"
- How do you market for the new Drone Program? > Social Media
- Later during design process, we need to contact Metro and understand all the bus routes and how they are connected to other schools
- What do you do with a Drone Degree? Need to learn how to analyze the data through the geospatial analysis & agricultural engineering from the drone.
- Fontaine could be an Aviation Consultant
- Will need hangar space with airside access.
- After you do repairs on a propeller, you will need to do a propulsion test:
 - Testing vibrations
 - Circular motion
 - Test for tolerances
 - Most important is compression (75 or above you are good)
- Potential new hangar would have classrooms and maybe (5 to 6) Back Shops.
- Methods & Standards for Mechanics:
 - Usually run through a checklist before going out to the field
- [T.F.]: You want to train your people in your own environment.
- Classrooms > Multi-Purpose
- Destination 225 (Southwest Airlines) Pathways:
 - Due to a shortage across the industry, the Destination 225° program will help Southwest reduce their dependency on the open market by allowing them to train future pilots on how to fly... and, specifically, how to fly the Southwest Way. For participants, the program paves the way to a career at the nation's largest domestic carrier based on passengers carried, Southwest Airlines.
 - Whether a pilot is hired from their Destination 225° pathways or through the traditional process, the pilot will be held to Southwest standards. <u>Learn more about the standards for</u> <u>becoming a First Officer at Southwest Airlines</u>. Through the Destination 225° Program, combined with their continued traditional hiring of First Officers, they aim to have the most experienced, passionate, and well-trained aviators joining the Southwest Team.
- All airlines have their own schools
- Creating an environment where they can get their license & training
- Hangar in LA was inefficient
- Have different partners for internship
- There is an issue between training & higher education
- Airlines are "soft" in areas such as customer service and beyond which means they have a high turnover rate.
- The industry is looking at possible electric planes in the future.
- TSU might build a new hangar near Lonestar Flight Museum.
- *Question:* How do you see different institutes in the same "HUB" at the Aerospace Institute site? *Answer:* Dr. Fontaine believes that all institutes can co-exist. They would all have to have the same MISSION when it comes to training.
- There would be collaboration between students not institutes.
- With the new Drone Program that is getting to ramp up, the school will start with light & medium drones for training.
- Looking into the airplane hangars to be solar powered.

HAS Aerospace Institute | Meeting Minutes Texas Southern University – L.H.O. Spearman Technology Building Tour 3100 Cleburne Street Houston, TX 77004



✤ <u>Virtual Airport Lab:</u>

- RD2 Redbird Simulator
 - Air traffic controllers sit behind pilots on one side of the room.
 - On the other side of the room, you have the Aviation Operations Manager (In Black SUVs).
 - No one can work without the other.









HAS Aerospace Institute | Meeting Minutes University of Houston Clear Lake 2700 Bay Area Blvd Houston, TX 77058



MEETING TOPIC: UHCL Campus Tour

MEETING DATE: 20 May 2022 at 9:30 AM – 12:30 PM LOCATION: 2700 Bay Area Blvd Houston, TX 77058

Meeting Attended by:

- <u>University of Houston Clear Lake</u>
 - o Dr. Christopher Maynard
 - Dr. Miguel Gonzalez
- <u>Houston Airports System</u>
 Susan Keil
- FS Group
 - o Sabir, F
 - Harry Knapp
 - Zain Koita
 - Valerie Bugayong
 - April Janiszak

Meeting Format:

- [CM] Looking for UHCL to "expand" programs and courses out to Aerospace Institute.
- [CM] One of the first to sign on to Spaceport closest to SP.
- CM Background Huntsville University of Alabama.
 - Had a committee in Huntsville, Alabama that would meet regularly with the Industry to make sure they have what they needed.
- Visible dedicated, physical space for: onboarding, support for internships.
- [MG] Desire to partner with San Jacinto for certificate programs.
 Engineering students can get more hands-on experience.
- Looking at Axiom + paid internship (not just credit bearing). Help pay the internship to full-time employment.
- UHCL has a strong relationship with San Jacinto College.
 - UHCL can partner with San Jacinto for a composite certification.
- UHCL is heavily involved with material research.
- Industry has a strong say with input.
 - Axiom will need roughly 1,000 people.
- Want a 'HUB' for onboarding internships.
 - Need visible dedicated space for internships.
 - 30 paid internships a year.

ORGANIZER: Valerie Bugayong, FSG

MINUTES DATE: 25 May 2022 AUTHOR: April Janiszak, FSG

University of Houston Clear Lake 2700 Bay Area Blvd Houston, TX 77058



- Text Prep (Grant Funded) & Industry Funded (UT San Antonio).
 - Can provide scholarships & grants.
- [CM] Strengthening the relationship with San Jacinto, currently partners on a 1-year grant to find pipelines between both.
- Signing ceremonies
- Provide summer camps
- [MG] Flexibility in design
 - Pickle Center (has flexibility)
 - o J.J. Pickle Research Center, UT Austin
 - TMAC, Arlington
 - o "You can always design stuff you can't make."
 - "If you build something for everybody, you'll have inefficiencies." (Deals with equipment manufacturers).
- [CM] Program needs for student base (common) area
 - Food
 - o Lockers
 - o Hoteling
- Access & Physical Security Concerns Important
- Cyber security is an issue.
- Access & Physical Security Concerns Important
- NASA Involvement?
- [MG] Commercialization vs. Federalization of space
- [CM] Contracts with interns are different than private on a federal level.
 UHCL serves the region, students. Go both ways public & private.
- Big on internships (but what about classrooms or labs?)
- Space Council / Federation / Committee needed.
- [MG] 2700 students w/ college (9,400 students @ UHCL).
 20% involved in internships increase paid int.
- [CM] UHCL = Regional Comprehensive
- Current room sizes at UHCL:
 - Lecture Hall (multi-purpose room) ~ 58' x 58'
 - Project Lab ~ 40' x 40'
 - Collaboration Rooms ~ 8' x 8'
 - Lounge / Collab Room ~ 15' x 20'
 - Computer Lab ~ 30' x 40'
 - Rock Processing Lab ~ 32' x 25'
 - Alcoves ~ 12' x 12' (9' ceilings)
- Campus includes loading docks & freight elevators for large equipment.

HAS Aerospace Institute | Meeting Minutes University of Houston Clear Lake 2700 Bay Area Blvd Houston, TX 77058



✤ Photos from Tour:













APPENDIX AUGUST 15, 2022 FS GROUP ARCHITECTS PROJECT DEFINITION MANUAL HAS Aerospace Institute | Meeting Minutes University of Houston Clear Lake 2700 Bay Area Blvd Houston, TX 77058















San Jacinto Tours at Transportation Center & Maritime Center La Porte, TX 77571



MEETING TOPIC:	San Jacinto Tours at Transportation Center & Maritime Center	ORGANIZER:	Sarah Janes, SJC
		MINUTES DATE: AUTHOR:	25 May 2022 April Janiszak, FSG

MEETING DATE: 24 May 2022 at 11:30 AM – 12:30 PM LOCATION: **SJC Transportation Center** 3501 Luella Blvd La Porte, TX 77571

> 24 May 2022 at 1:30 PM – 5:00 PM **SJC Maritime Center** 3700 Old Hwy 146 La Porte, TX 77571

✤ MEETING ATTENDED BY:

- San Jacinto College
 - o Dr. Sarah Janes
 - o Dr. Janis Fowler
- Houston Airports System
 - o Susan Keil
 - o Jimmy Spence
- FS Group
 - o Sabir, F
 - o Harry Knapp
 - o Zain Koita
 - Valerie Bugayong
 - o Rukaiya Jamali
 - April Janiszak

✤ MEETING SUMMARY:

• Design Charrette.

✤ MEETING NOTES:

- FACILITY SPACES:
 - o Computer Labs
 - o Classrooms
 - Conference Rooms
 - o Labs
 - Library /Book Area
 - Faculty Offices / Faculty Areas
 - o Storage Areas
 - o Loading Area
 - Heavy duty cranes
 - \circ Big bay
 - Clean room

San Jacinto Tours at Transportation Center & Maritime Center La Porte, TX 77571

FSGROUP"

- Large indoor drone flight area
- Overhead door in lab
- o Runway / Hangar
- Exhibit Area (planes, drones, Spaceport)
- Area for working on planes
- o Bathrooms
- o Passenger elevators / freight elevators
- o Stairs
- o Kitchen / Café
- o Student tutoring meeting areas
- Propulsion
- o Aviation

* **RELATIONSHIPS**:

- Outside: close to IM, Collins, Axiom (walking distance walkway)
- Inside: Dirty labs separate from cleaner labs.

✤ <u>SITE ELEMENTS:</u>

- Outside tables / picnic tables / BBQ
- Common work areas inside for the collab maker space
- Viewing Area for Wings over Houston
- Covered parking?
- Place for plugging in your electric car / charging stations
- Bike racks?
- Flag poles (how many flags do you need to fly?

✤ <u>ADJACENCIES</u>:

- Multi-purpose room near Reception / Lobby.
- Breakroom office adjacent from the Reception Area.
- Shared & flexible spaces.
- Observation deck off of composite labs.
- Level 1 Labs with heavy equipment
- Level 2 Classrooms / Offices.
- Helpful to look down from 2nd floor.
- Good view.
- How is the money going to flow at the HUB between industries?
- Electronic Labs (AR / VR) Augmented Virtual Reality
- (6) AR / VR Labs (small labs).
- (6) Regular classroom
- Clean RoomC: 30' x 30' (12' tall ceilings) + OH Door
- Composites > 3D Printing
- Fabric
- NIDA
- Painting & Coating
- Textiles
- Small Labs: 30' x 30' > Lower Ceilings
- (4-5) Specialty Labs
- (3-4) Testing / Computer Labs

San Jacinto Tours at Transportation Center & Maritime Center La Porte, TX 77571



- Propulsion Testing (medium lab)
- Shake Table
- (1) Admin > (2) Staff > (1) Huddle Room for 6 people > (1) office (run totally on adjacent faculty)
- Faculty parking needed
- Monterrey Tech Conference (June 5th 7th)
- Chris Maynard & Susan Janes will be going to conference.
- San Jacinto is okay not meeting with the industries.
- Per Dr. Janes > San Jacinto won't be ready for a new building maybe for at least 10 yrs.

✤ SMALL LABS:

- o AR / VR
- o Flexible spaces
- o Computer lab spaces
- (6) Classrooms
- Clean Rooms (30' x 30')

✤ LARGE LABS:

- Welding (4-5 People)
- Common high bay space
- High bay area for cranes (10-20 Ton) crane bridge
- Venue Airspace
- Medium Labs
- o Fabrication
- Electronic
- o 3-D Printing
- Painting & Coating
- Composites
- o Tiles
- Material Handling
- Soft Goods / Textiles
- Propulsion Lab (6 rooms)

✤ <u>AMENITIES:</u>

- o Cafeteria
- o Auditorium
- Lecture Halls
- o Coffee Shops
- o Break-out spaces
- Outdoor Terraces
- Faculty Lounges (shared)
- Student Lounge Space
- Balconies & views
- o Snack rooms / Lunchrooms
- o (4-6 People) Huddle Rooms
- Quiet Room
- o Breakout Room

San Jacinto Tours at Transportation Center & Maritime Center La Porte, TX 77571



* CHARACTER ELEMENTS:

- Conference Room (12-50 People)
- Lobby: Multi-Purpose Room
- (1) War Room
- (3) Conference Rooms (12 People)
- o Planetarium
- o Green Roof
- o Admin Area (Level 2)
- Executive Offices
- o Staff

✤ <u>LIBRARY:</u>

- Adjust faculty
- o Supplies
- o Counselors / Student Coord
- o Freight Elevator

TASK #1 – SPACES, LABS, & CLASSROOMS

- Large Labs Industrial Labs (High Bay) > (1 or 2): Loading dock access, highest roll-up doors, bridge crane, wheeled crane
- Medium Labs: (6) Labs > Tall Ceilings > Exterior Access
- o Fabrication
- o NIDA Electronics
- o Painting & Coating
- 3-D Printing
- o Composites
- Materials Handling
- o Small Labs
- o (3-4 Person) Classroom Labs
- ÅR/VR
- Testing / Computer
- Soft goods (sewing)
- Classrooms (0)

✤ TASK #2 – AMENITIES

- Building Amenities
- Faculty Lounge(s)
- Student Lounge Areas small areas spread out
- Collaboration Areas
- o Windows w/ balconies & green space views
- o Snack Areas
- Food service Cafeteria
- o Quiet Room
- Offices in lab
- Breakout Room in Labs Small Huddle Rooms
- Main entry (wow factor)
- Storage spaces

San Jacinto Tours at Transportation Center & Maritime Center La Porte, TX 77571



- (3-4) Conference Rooms small to medium (25-30 people)
- Multi-Purpose Room adjacent to entry hall
- Transporter Room
- Hoteling
- Triage / Advisor
- Historical Exhibit / Interview Character Elements
- Loading Docks (To large labs & some medium labs)
- Door access
- o Freight elevator
- Gift vending

TASK #3 – RELATIONSHIPS (more amenities)

- Relationships & adjacencies between spaces inside bldg.
- Site San Jacinto relationships
- o Inside the building
- Shared / flexible spaces
- o Common electrical receptacle grip
- On-site relationships
- Main Entry @ corners
- View from building to Spaceport
- o Building site / elements
- o Mini Amphitheater
- o Photo-Op / press release area
- o Flag area
- Material handling (inside building)
- How will the money flow for lab rental?
- o Each college will want an office downstairs up front admin / on-boarding
- Administrative Area
- \circ 1/2 the size of the Charette Room
- Metro Access: (with San Jacinto)?
- \circ $\,$ Covered vehicle / passenger loading. Dropoff / UBER / Bus

HAS Aerospace Institute | Meeting Minutes San Jacinto Tours at Transportation Center & Maritime Center La Porte, TX 77571



* PHOTOS FROM TOUR:













APPENDIX AUGUST 15, 2022 FS GROUP ARCHITECTS PROJECT DEFINITION MANUAL HAS Aerospace Institute | Meeting Minutes San Jacinto Tours at Transportation Center & Maritime Center La Porte, TX 77571















Industry & Educational Partners Meeting with Axiom Space EDGE Center upstairs conference room 13150 Space Center Blvd, Houston, TX 77059



MEETING DATE: 16 June 2022, 2:00-3:30pm LOCATION: The EDGE Center 13150 Space Center Blvd, Houston, TX 77059

ATTENDEES:

Axiom Space Axiom Space Houston Airport System San Jacinto College UH Clear Lake UH Clear Lake FS Group Architects FS Group Architects FS Group Architects FS Group Architects Frank Eichstadt Teddi Pruitt Susan Keil Dr. Sarah Janes Dean Miguel Gonzalez Dr. Christopher Maynard Sabir, F. Harry Knapp Valerie Bugayong Zain Koita

MEETING To determine AXIOM SPACE's workforce needs PURPOSE: Based on current and future conditions So that we can allocate physical spaces in the Spaceport HUB And make provisions for future expansion.

EXECUTIVEThe Aerospace Institute will create an educated and trained workforce to supportSUMMARY:industrial partner training and collaboration at the city/state/country level.More outreach is needed with industry to garner support for funding.



Seated (L-R): Dr. Christopher Maynard, Teddi Pruitt, Dr. Sarah Janes, Sabir F., Dean Miguel Gonzalez, Frank Eichstadt, Susan Keil, Zain Koita, Harry Knapp.



✤ INTRODUCTION:

Harry Knapp, FSG Architects

Mr. Knapp introduced the meeting and stated its purpose. The short time frame of the meeting focused discussion on Axiom's needs and its relationships with educational interests.

Sabir F., FSG Architects

Sabir gave a brief summary of the project to date, and the interaction between the design team, educational partners, and the Houston Airport System.

Following is a summary of key points and exchanges between meeting members.

*	INDUSTRY NEEDS:	Frank Eichstadt, Axiom Space
		Companies could bring their experts and engineers to access machines (at the HUB), for lower investment in creating a product.
		NASA has a stake in the development of the commercial spaceflight industry.
		Start with optimization and end with a viable product.
		"The Blue Sky approach leads to optimization, providing a collectively accessible toolbox – a resource collaboration."
		Accurate technical communication is a valued skill set for new-hires.
		Exhibition spaces that change periodically at the HUB. Labs might also become exhibition spaces.
		Interns should dedicate one hour per week for professional development.
		Display technology that is not well-known to the community.

"Now that I know how to build it, how do I test it?"

Industry & Educational Partners Meeting with Axiom Space EDGE Center upstairs conference room 13150 Space Center Blvd, Houston, TX 77059



Axiom would like to create quality data through testing- and skillbased training.

Veterans are preferred for employment for their maturity and skill-sets, aligning well with Axiom's expectations and culture.

Types of certificates that could be needed: avionics and wire harnessing.

The Institute could offer courses in the history of aerospace (for space tourists).

The Institute will be THE anchor tenant at The Spaceport.

* EDUCATIONAL NEEDS: Dr. Christopher Maynard, UH Clear Lake

Stressed the need to collectively meet the needs of certificates and career paths without gaps.

Paid internships is a win-win between industry and education.

Dean Miguel Gonzalez, UH Clear Lake

Potential labs for the HUB include: Metrology Lab (the science of measuring); Customized (not mass) production.

"Access to human capital can attract industry."

Industry could test their equipment as a part of collaboration efforts.

Capstone design courses teach a form of DFX for design optimization.

Dr. Sarah Janes, San Jacinto College

Advisory committee meetings continue, and a new survey has been sent out.

SanJac is considering an Associate Degree in Engineering Technology.

SanJac teaches a technical writing course.

The Institute should be flexible to meet evolving future needs.

Industry & Educational Partners Meeting with Intuitive Machines EDGE Center upstairs conference room 13150 Space Center Blvd, Houston, TX 77059



MEETING DATE: 16 June 2022, 3:30-5:00pm LOCATION: The EDGE Center 13150 Space Center Blvd, Houston, TX 77059

Intuitive Machines Jack Fischer ATTENDEES: Houston Airport System Susan Keil San Jacinto College Dr. Sarah Janes UH Clear Lake Dean Miguel Gonzalez UH Clear Lake Dr. Christopher Maynard FS Group Architects Sabir, F. FS Group Architects Harry Knapp Valerie Bugayong FS Group Architects FS Group Architects Zain Koita

MEETINGTo determine INTUITIVE MACHINES' workforce needsPURPOSE:Based on current and future conditionsSo that we can allocate physical spaces in the Spaceport HUBAnd make provisions for future expansion.

executive summary: The Aerospace Institute needs a 'Space Czar' to market, promote, and facilitate commercial development at the Spaceport.



Seated (L-R): Harry Knapp, Valerie Bugayong, Dr. Christopher Maynard, Jack "2fish" Fischer, Dr. Sarah Janes, Sabir F., Dean Miguel Gonzalez, Susan Keil.

HAS Aerospace Institute | Meeting Minutes Industry & Educational Partners Meeting with Intuitive Machines EDGE Center upstairs conference room 13150 Space Center Blvd, Houston, TX 77059



INTRODUCTION:

Harry Knapp, FSG Architects

Mr. Knapp introduced the meeting and stated its purpose. The short time frame of the meeting focused discussion on Intuitive Machine's needs and its relationships with educational interests.

Sabir F., FSG Architects

Sabir gave a brief summary of the project to date, and the interaction between the design team, educational partners, and the Houston Airport System.

Following is a summary of key points and exchanges between meeting members.

✤ INDUSTRY NEEDS: Jack Fischer, Intuitive Machines

Much of Mr. Fischer's experience involved taking over spaces which were <u>not</u> built-to-suit and making them work (similar to The EDGE Center).

Highlighted the fact that the three existing Spaceport partners all had seed money from the City. Many smaller outlets will not have this advantage.

The Institute development team must become more familiar with some of these potential partners and advocates:

- Getting NTS (space testing) involved would be helpful.
- Flextronics is well-known for prototyping absent in
 - Houston. They are the best in the business for space parts.
- Greentown Labs is a startup incubator offering prototyping, office, and lab space.

Houston focuses on oil and gas industries and is not the best business environment for new technologies.

Goal – Make Houston "Space City" again.

The Star Harbor campus in Colorado is the first space academy to teach people about the space industry. It has DOD support.

Industry & Educational Partners Meeting with Intuitive Machines EDGE Center upstairs conference room 13150 Space Center Blvd, Houston, TX 77059



Houston is far behind Colorado in space business development. We don't lack talent, we lack infrastructure. Houston needs and <u>attractive angle</u> that makes relocating to Houston worth it.

Houston needs to appoint a city-level Space Czar.

At the state level, cities can be delegated to space specialties for a complete package of industries for Texas. Examples: Harlingen for launch; San Antonio for cyber; Houston for space hardware (and we really want the hardware).

There is a need for affordable physical space for startups. Offering incentives could help development.

Shared infrastructure at Spaceport would be very beneficial to IM – equipment & machinery (shake table).

It is important to have an operational working system up and running early. Waiting until the entire HUB is complete loses valuable time and has high front-loaded costs. Smaller companies need to get moving quickly and cheaply. Taking over empty nearby commercial retail space might be helpful for startups.

Find a way to make Houston Spaceport unique to attract others and drive business.

Infrastructure needs for business:

- 3D Printers
- Thermal Vac Chamber
- Shake Table
- Big Skiff

Desirable skills and training for new employees:

- Composite Techs
- Avionics
- Electricians
- Life Support
- Chemical Engineers
- Specialized Internships

The model at EDGE Center is exactly what IM needs.

Higher level degree programs in Aerospace should be created.

"We've got a Jimmy."

HAS Aerospace Institute | Meeting Minutes Industry & Educational Partners Meeting with Intuitive Machines EDGE Center upstairs conference room 13150 Space Center Blvd, Houston, TX 77059



* EDUCATIONAL NEEDS: Dr. Christopher Maynard, UH Clear Lake

There is value in an exchange of information for stackable credentials.

What are specific companies seeking?

What gaps can UHCL and SanJac fill and expand that are not present at The EDGE Center?

The Huntsville space industry works because it enjoys full engagement with focused goals & a collaborative spirit.

Dr. Sarah Janes, San Jacinto College

Are certificates individually earned or part of a degree program better for the student?

Why does EDGE work? It is tailored to what industry needs.

* HAS & FSG ARCHITECTS: Susan Keil, Houston Airport System

How can we attract additional businesses to the Spaceport?

Who will pay for the Institute?

We need more political support at both the City and State level to underscore that this is a 'going concern'.

Sabir F, FSG Architects

Good point about appointing a Space Czar. Promotion of the Spaceport on a local and state level is very important. This is not a typical developer parcel. LDS (Llewelyn-Davies Sahni) and Jacobs are working on overall site development. FSG is available to participate in meetings and progress updates.

Harry Knapp, FSG Architects

Mr. Knapp: How many students has IM hired? Mr. Fischer: **10-12 student hires**.

Mr. Knapp: What is the IM workforce and prospects in the near future?

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Mr. Fischer: We have **170 current employees**, with plans to scale to 300 over the next 2 years. We are bidding large contracts and are partnered with Jacobs at JSC.

Valerie Bugayong, FSG Architects

Can EDGE be absorbed into the HUB?

Meeting adjourned 4:45pm.

Industry & Educational Partners Meeting with Collins Aerospace UH Clear Lake STEM Building 2700 Bay Area Blvd, Houston, TX 77058



MEETING DATE: 22 June 2022, 2:00-3:30pm LOCATION: UH Clear Lake STEM Building 2700 Bay Area Blvd., Houston, TX 77058

ATTENDEES: Collins Aerospace Da Collins Aerospace Rya Collins Aerospace No Collins Aerospace Tro Houston Airport System Sus Houston Airport System Jim UH Clear Lake De UH Clear Lake Dr. UH Clear Lake Dr. San Jacinto College Dr. FS Group Architects Sat FS Group Architects Ha

David Romero Ryan Kagey Norman A. Hayes Troy Eastin Susan Keil Jimmy Spence Dean Miguel Gonzalez Dr. Christopher Maynard Dr. Richard Walker Dr. Sarah Janes Sabir, F. Harry Knapp

MEETINGTo determine COLLINS AEROSPACE's workforce needsPURPOSE:Based on current and future conditionsSo that we can allocate physical spaces in the Spaceport HUBAnd make provisions for future expansion.

EXECUTIVE SUMMARY: The Aerospace Institute needs a 'Space Czar' to market, promote, and facilitate commercial development at the Spaceport.



Standing (L-R): Dean Miguel Gonzalez, Dr. Christopher Maynard, Dr. Richard Walker, Sabir F., Jimmy Spence, Dr. Sarah Janes, Ryan Kagey, David Romero, Norman A. Hayes, Troy Eastin.

HAS Aerospace Institute | Meeting Minutes Industry & Educational Partners Meeting with Collins Aerospace UH Clear Lake STEM Building 2700 Bay Area Blvd, Houston, TX 77058



INTRODUCTION:

Harry Knapp, FSG Architects

Mr. Knapp introduced the meeting and stated its purpose. The short time frame of the meeting focused discussion on Collins' needs and its relationships with educational interests.

Sabir F., FSG Architects

Sabir gave a brief summary of the project to date, and the interaction between the design team, educational partners, and the Houston Airport System.

Following is a summary of key points and exchanges between meeting members.

* INDUSTRY NEEDS: David Romero, Collins Aerospace

Collins has existing and new NASA contracts for EVA space suits.

We see a couple of ways that (Spaceport) benefits us:

- 1. To pull from people that are in AI programs to help build and support our team.
- 2. Ability for Collins' team members to continue to grow their capabilities.

We have a community responsibility as part of our core values.

Collins' research activities at the Raytheon Research Center in Connecticut might be relocated to Houston, partnering with local institutions or firms.

Set aside 10,000 SF for small business incubator opportunities for small business partnerships.

40-50 certifications needed soon (need to be certified every 2 years) and NASA has 100s needed. Could San Jac provide this?

There is a huge difference between learning theories & hands-on practice.

Culture that we wrestle with: Agile introduces a new way of learning allowing you to fail to get it right.

HAS Aerospace Institute | Meeting Minutes Industry & Educational Partners Meeting with Collins Aerospace UH Clear Lake STEM Building 2700 Bay Area Blvd, Houston, TX 77058



Right in the thick of implementing Augmented Reality PLM System Windchill.

Soft goods/ Engineering work for the new program will be in Houston which requires a high level of engineering.

Approximately 30% of small business goals for programs partnering will continue & grow with company growth.

How many students will you have at the HUB? ---Dean Gonzales: 2500 students in STEM Chris Maynard: 9500 students at UHCL (not trying to replace but want to complement it).

Ryan Kagey, Collins Aerospace

We can put a pipeline together for flexible hours and greater job satisfaction.

We would like to hire people with the right mindset & work ethic.

New positions include such as material movement.

Have a local materials facility at Windsor locks.

Putting in a chemistry lab and precision cleaning line.

Norman A. Hayes, Collins Aerospace

Hoping San Jac would evolve electrical certifications up to industry standards to send current employees to get certified.

Troy Eastin, Collins Aerospace

Currently have 7-10 interns.

30% of new-hires are students.

Trying to go paperless in the new facility.

* EDUCATIONAL NEEDS: Dr. Christopher Maynard, UH Clear Lake

We want to provide multiple entry- and exit-points for students to learn new skills / credentials / certificates / badges.

Industry & Educational Partners Meeting with Collins Aerospace UH Clear Lake STEM Building 2700 Bay Area Blvd, Houston, TX 77058



Having spaces & resources to help interactions amongst the different entities.

Is there value to have shared equipment/machinery space & student use?

Ryan: Collins is adding specialized equipment in their space, but 3D printing is desired

Troy: 3D printing manufacturing has high interest among students

Brown bag lunches to showcase new products.

Constantly trying to expose new speakers & industries to students to help energize.

Dean Miguel Gonzalez, UH Clear Lake

Developing an engineering management program for supply chains.

Other programs include:

- OSHA program
- Composite Manufacturing
- Advanced Wiring

Hands-on training – turning dreams into reality.

The Institute could be a catalyst for K-thru___ practice pathways, Bachelors, Masters & PhD.

We are working with the Texas Manufacturing Assistance Center (TMAC) to promote competitiveness.

Dr. Richard Walker, UH Clear Lake

We are doing a number of MOU agreements and working with Deans to attain the right experience targeted with specific industry partners.

In the final stages of an agreement with Boeing for internships with hands-on experience.

Dr. Sarah Janes, San Jacinto College

As new Collins contracts arise, knowing what training and equipment is needed – in advance – helps SanJac to plan ahead.



We have \$600K in Federal appropriations approved for programs such as high dollar sewing machines.

Many people talk about pathways (to success), but I believe in stairways and landings.

(Sabir: That's the stacking approach).

Forum for 4 universities & SanJac to get together every 2 weeks.

MOU in place.

* HAS ANALYSIS: Jimmy Spence, Houston Airport System

It is essential to build value for current and future tenants.

We want to incorporate as many levels of education as possible.

Susan Keil, Houston Airport System

Have an exhibition space to slow colleagues which could energize the space.

Small pilot plants.

6-8 months for training. No training opportunities...the Institute could easily take this on.

Benefit to Collins

a. Hiring

b. Community Responsibility- Core value. Build up the capabilities of the community. This was the first time hearing this (of the 3 Industrial Partners).....not to say that this is not shared by all 3....just the fact that Collins STATED this caught my attention.

* FSG ARCHITECTS: Sabir F., FSG Architects

How do you train staff today? On your equipment or could you sub it out?

The Aerospace HUB is a place where exhibitions & events for the company can be hosted.

Exhibition. Collaboration.

Meeting adjourned 3:45 pm.

10 CONCLUSION

CONCLUSION

The main purpose of this Project Definition Manual IS to outline the positive impact the Aerospace Institute at the Houston Spaceport would have on government, industry and academia. It would energize, mobilize and revitalize the present workforce pool. By harnessing the interest of the community, not only will it increase workforce size, but also increase the number of specialized staff. Based on the study done by MGT Consulting group, Houston has an industrious population that can be educated and trained for industry requirements.

While being in close proximity to an influential group of industry pioneers as well as being easily being accessed by land, air and sea, The Aerospace Institute will be situated in a prime location that will allow the growth and expansion of the Houston Spaceport. The quality training and higher education based on industry requirement and industry involvement will be the incentive for other aerospace companies to join. Currently, the Houston Spaceport is on competitive grounds with 11 of the other spaceports in the country. The Aerospace institute will help Houston become the quintessential "Space City."

The other purpose of this PDM was to study the needs of both industry and academia that would efficiently allow a flexible curriculum. Changes in workforce training is unpredictable; the ability to adapt is what makes the Aerospace Institute an integral part of the system. The program and design was derived from industry and academic needs that will foster a more seamless collaboration within the aerospace community.

NEXT STEPS

1. Continue the planning development of the Aerospace Institute at the Houston Spaceport.

This PDM provides the vision and program necessary to create the building for the Aerospace Institute. The PDM also provides a conceptual design of the proposed facility. The next step is to proceed with the schematic design phase and engage all the design consultants to begin the design process.

2. Presentation of the PDM to a wide audience.

Presentation of this PDM, along with robust social media. Along with strong social media presence the MGT report suggests the creation of a virtual presence that has been shown to accelerate the program in tandem with the development of a physical location. An example might be a Virtual Recruitment Booth (used at events, successfully provides context for the initiative).

3. Suggest a 'reintroduction' of the project by HAS Senior Management to City Leaders and other entities.

During interviews, several industry partners suggested that Houston is lagging behind other spaceports (Colorado) due to the lack of dedicated political support. The Aerospace Institute Initiative with the introduction of this newly created PDM is at a critical point to create critical infrastructure (liaisons) necessary to move forward. This PDM provides a comprehensive plan to engage political leadership to help create an important space infrastructure.

4. Identify, assess and mitigate any obstacles to Academic Partner participation in realizing the objective.

a. The PDM Aligns facility needs of the academic and industry partners with the proposed build out programmed spaces outlined in the PDM. As new partners emerge and additional interest is generated to engage at the Aerospace Institute, the phasing of the building can be changed and adapted to accomodate.

5. HAS provides additional resources and support in next stages:

- a. Establish a 501c3 (eligibility needed to apply for federal grants or other such opportunities).
- b. Resource additional funding:
 - i. Review opportunities to provide shared equipment to be utilized not only by current Spaceport partners but by other start-ups loacated at the Aerospace Institute.
 - ii. Provide Space and operational support for smaller start-ups at the Aerospace Institute.
 - iii. Provide exhibition space for small start-ups wanting to get in front of a larger Aerospace Industry community.
 - iv. Provide opportunity for Industry seminar / lecture at the auditorium of the Aerospace Institute.

6. Track progress: Encourage the use of a template to track progress:

The MOU (Memo of Understanding) has proven to be an invaluable document, used to declare objectives and partner commitments along with tracking progress. After the PDM, the progress will be tracked as we move into schematic design, project funding and construction phases.

7. Pick Champion : A Leader to promote and market the Spaceport and Aerospace Institute

An example of a champion is **Texspace.** their goal is to support companies and entrepeneurs by removing barriers for space innovation. They aim to be the future hub for pooling resources and promoting growth for the U.S. space industry. They promote investing in space and are laying down the foundation as a Texas State Charted Public-Private Partnership that allows industry growth.

The champion shall be tasked with Maintaining communications with community partners, attending local and regional events for member recruitment opportunities, and cultivate relationships with market partners.

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