



**MICHIGAN OFFICE OF DEFENSE
AND AEROSPACE INNOVATION**

***Michigan Office of Defense & Aerospace Innovation Strategic Plan
Appendix:***

Space Economy Campaign Plan for Michigan

FY 2025-2026



I. FY2026 Revised

As with any plan and/or strategic approach designed to span several cycles, flexibility must be incorporated at the outset, with the vision and ability to refresh and revise said plan on a regular, however not too frequent, basis. As external and internal variables, factors, operating environment, etc. inevitably change over the course of time (and as objectives within a plan are addressed) there is a need to review and refresh the plan to maintain relevancy and efficacy within a given current environment. The *Michigan Office of Defense & Aerospace Innovation (ODAI) Space Economy Campaign Plan for Michigan*, was developed for initial execution in FY2025 and designed with this type of flexibility in mind.

Herein, is a refresh of the FY2025 Campaign Plan. The initial FY2025 Campaign Plan begins on page ii of this document. Using the FY2025 specific Campaign Strategic Lines of Effort (LOE) as a starting point, an outline of ODAI's primary direction and objectives of this Campaign for FY2026 was developed and is presented beginning on page 23.

II. Initial Space Economy Strategic Campaign Plan (FY2025)

Executive Summary

Michigan's existing space ecosystem was founded due to significant participation in space-based programs, dating back to the 1940s, when the first space programs were established by the U.S. Government. With this participation came the establishment of renowned research programs and private industry, albeit small, to support follow-on government missions in space.

Michigan now has an opportunity to further diversify its economy by supporting and expanding this extant ecosystem of academic programs and corporate participants in a growing Space Economy. Doing so will require four key elements working together: (1) unity of purpose between the Office of the Governor, Federal and State legislatures, industry, and academia; (2) talent creation, retention, and attraction; (3) a coordinated marketing campaign; and (4) encouragement and enhancement of existing Space Economy clusters and creation of targeted innovation hubs. A Michigan Space Economy can flourish by coupling these elements with an already existing space research and remote sensing ecosystem.

The current and projected growth of the Space Economy has garnered the attention of Governments, businesses, and investors worldwide. For instance, the government and commercial markets for remote sensing alone are significant as both markets have interest in monitoring environmental changes in the land, oceans, and atmosphere. The commercial remote sensing industry alone is estimated to grow to \$6B by 2026 with a CAGR of 11%. As such, the market is providing multiple billions of dollars annually in support of their needs.

In response to this opportunity, the MEDC initiated a strategic planning activity to identify the steps required to best grow Michigan's participation in the Space Economy. **A major premise of the resulting Strategic Plan is that a highly qualified and respected workforce provides the impetus that can lead Michigan's growth in the Space Economy.** Establishing such a workforce will require: (1) leveraging the excellent, world-class research being performed by Michigan's space ecosystem, (2) concentrating on talent development, retention, and attraction, and (3) creating an environment that allows an individual's entrepreneurial spirit to flourish. In addition, the State of Michigan's industrial base prides itself on its ability to manufacture and build concept into reality. From commercial off-the-shelf products to advanced, complex defense and aerospace platforms and components, **Michigan excels in its capability to manufacture, which will be a key component of Michigan's Space Economy.** With these key initiatives in place the Michigan space ecosystem will have an opportunity to grow and establish new products, new markets, and develop a reputation as a leader in Space Economy,

and furthermore will align with the State of Michigan’s “You Can in Michigan” and “Make it in Michigan” strategies.

In the near term, it is recommended that Michigan support the following activities while creating, retaining, and attracting a highly talented workforce supporting the Space Economy. Specifically, it is recommended that Michigan:

- Establish a Unity of Purpose. It is recommended that a coalition business model be established in Michigan that includes the establishment of a Space Coalition, with representatives from both industry and academia; and a Space Business Roundtable that is internally focused on STEM and matchmaking between small, medium, and large businesses.
- Promote Space Education.
 - Conduct Challenges or competitions to provide a means for Michigan college students to learn their trade by applying the lessons learned in the classroom to real-world problems.
 - Using the highly successful First Robotics as a model, begin a First Space program for Michigan.
- Create a Space brand by first attending key events to establish Michigan’s presence within the rest of the space community.
 - Improve outreach through participation in space-related associations, identifying the appropriate messaging for use in discussions.
 - Attend key space-related meetings and conferences such as the Aerospace States Association (ASA) Annual Meeting and State Aerospace Policy Symposium.
- Encourage and enhance existing Space Economy clusters in Southeast Michigan and in the Upper Peninsula and establish or reinforce targeted hubs in remote sensing and space research. Using existing incubator/accelerators as an example (e.g. Michigan SmartZone), create and/or leverage existing incubators that provide office space, communication, mentorship, and meeting spaces for businesses that are creating new products and services for the Space Economy.
 - Also, establish industrial outreach programs for space to better connect industry with academia. These programs might include invited speakers from industry or establishing research projects that are executed together.

Michigan Space Strategic Planning Executive Committee (FY2025)

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Mr. James Miles, COO of iQMRI

Mr. Donald Moore, Chief Executive Officer, and Co-Founder. GeoJump

Dr. John Papapolymerou, MSU Foundation Professor and Chair, Electrical and Computer Engineering, Michigan State University

Mr. Roger Reinhold, Program Manager Sensor Programs, Maxar Intelligence

Dr. Jeremy Stringer, Michigan Technological Institute

Michigan Space Strategic Planning Community of Interest (COI), (FY2025)

(The Space Strategic COI consists of the following members in addition to the executive committee)

David Ager, Leidos

Scott Belanger, KBR

Mike Carey, Atlas Ground Systems

Chris Caruana, FAAC

Tom Drumond, Orions Quest

Scott Haviland, EMAG Technologies

Brad King, Orbion Space

Karl Klimek, MAC

John Kormash, SAIC

Kristina Lemmer, Western Michigan University

Troy Morris, Kall Morris Inc

Mike Liemohn, Michigan Space Institute

Dan Mishler, RF Bistatics

Mark Moldwin, Michigan Space Grant Consortium

Chris Olson, Chippewa County

Jeffrey Pennings, Wolverine Radar

Mike Price, DVMA

James Sayer, University of Michigan

Christopher E. Smith, Lake Superior State University

Greg Wildes, Dornerworks

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A. Introduction

This volume provides a Space Strategic Plan for establishing a vibrant space ecosystem in Michigan to foster cutting-edge research and encourage new space related product and service development industries. The Plan provides information for focusing Michigan’s efforts from the larger set of opportunities that the Space Economy offers, and it provides specific actions for moving forward on these focused efforts.

The Michigan Economic Development Corporation (MEDC) established a strategic planning organization to create the Space Strategic Plan. This organization consisted of two groups: (1) a small Executive Committee that developed a five-year Vision (see Volume I), and prepared information and a recommended action plan; and (2) a Space Community of Interest (COI) that provided additional input and feedback on the plan. Over the course of one year starting in May 2023, the Executive Committee met monthly while the COI met two times.

The Space Strategic Plan presented in this document consists of three parts: an introduction, a description of the opportunity, and the Strategic Plan itself. Following the introduction, Part I of this document sets the stage regarding the opportunity for Michigan to diversify its economy. The section begins by mapping the opportunity and showing the potential market sizes for work already existing in Michigan. In summarizing the global space market, it provides information regarding the future opportunities in the Space Economy. Next is a discussion on Michigan’s ability to participate in the Space Economy. This discussion describes Michigan’s space legacy and offers evidence of existing core strengths from which to build upon. The next part provides specific instantiations of these strengths. Finally, this section concludes with an inventory of organizations that exist in Michigan having primary operations supporting the space industry. This inventory is used to create heat-maps showing where the concentration of work is located. In essence, this section provides a “wall of truth” that provides evidence of an existing space ecosystem in Michigan.

Part II of this plan provides a proposed path for moving forward with a space initiative in Michigan. It begins by listing five space verticals that might compose a Space Economy for Michigan. Next, is an in-depth discussion of each vertical that includes: (1) a description of each and a categorization of each existing organization into one of the verticals; (2) an analysis of the Strength, Weaknesses, Opportunities, and Threats (SWOT) regarding Michigan’s position per each vertical. The section concludes with a recommended strategy for moving forward. Within it is a listing of five strategic initiatives that make up the Space Strategic Plan. Short-, mid-, and far-term actions are recommended for each of these initiatives.

B. The Opportunity

The global Space Economy is growing and offers a compelling opportunity for the State of Michigan to further diversify its economy. Michigan’s role in the Space Economy is best exemplified through the original investigations into Ballistic Missile Defense at Willow Run Laboratories in 1946; its major contributions in remote sensing for overhead reconnaissance for the US Department of Defense (DoD); and the application of remote sensing for the study of planetary, atmospheric, Earth, and associated environmental sciences. Michigan’s excellent legacy and strong foundation in space has established a leading position in the Space Economy for the state. This Strategic Plan lays out a unifying vision for fostering and increasing Michigan’s role and economic standing in the expanding Space Economy.

There is evidence that Michigan can grow and sustain a substantial presence in the space industry. A space ecosystem of companies, non-profits, and universities has operated in Michigan for decades. In addition to those organizations associated with the remote sensing sector, other new Michigan-based companies such as Orbion Space Technology and Atlas Space Operations serve as models for a diversified business environment in Michigan.

The value of participating in the Space Economy goes beyond just monetary gains—it is also an industry that attracts highly sought-after knowledge workers. Space-related work fuels a person’s imagination and attracts individuals with a strong background in Science, Technology, Engineering, and Mathematics (STEM). Hence, space attracts the type of highly skilled labor from which the state can build as it sets its vision for competing in the 21st century.

This Space Strategic Plan describes the market, Michigan’s unique capabilities in this market, and, by starting from our position of strength, provides a plan for moving forward in growing Michigan’s Space Economy.

B.1 The Global Space Market

A strong federal and commercial Space Economy exists with the commercial market showing significant growth--moving towards \$1,000B by 2030.

With the attraction of public and private funding and ongoing commercialization, the Space Economy is large and growing. What was once strictly a government market has now expanded into a viable commercial market with applications in television, satellite TV, radio, and navigation. As shown in Figure 1, the total 2022 funding for all sectors of the global Space Economy was \$384B. As Figure 1 also shows, the federal government maintains a large presence in the Space Economy with a 2022 operations budget of \$101.7B.

B.2 Why Michigan?

With MEDC's renewed commitment to aerospace and regional clusters, such as Ann Arbor and its strong reputation in remote sensing, a core strength exists that provides a foundation from which to build.

Given that there are more than 900³ aerospace firms within Michigan, and the fact that Michigan is the fastest growing state in AS9100 certifications⁴, the MEDC and the state of Michigan have recently renewed their commitment to the aerospace and defense aerospace sectors. As such, aerospace has been defined as a composition of three pillars: 1. Traditional Aviation; 2. Advanced Aerial Mobility; and 3. **Space**. Recognizing the value of the growing and further commercializing space market, and as evidenced by the development of this report, MEDC has ensured that space opportunities are duly considered for exploration and investment. As the space segment is contemplated, the first step is to recognize and understand historical as well as current assets, initiatives, and activities within Michigan with ties to the Space Economy.

From the beginning of space exploration, Michigan has been a strong participant in the research and development of space-related products and services. Much of the space-related work has been performed by the University of Michigan and its spin-offs. This work began in the Electrical Engineering Department at the University of Michigan and was strengthened in July of 1946 when the University of Michigan established the Michigan Aeronautical Research Center (MARC) located at the Willow Run Airport in Ypsilanti, renamed Willow Run Laboratories in 1955. Willow Run Laboratories performed the initial research that led to the DoD's Ballistic Missile Defense initiative. It also had a strong role in the development of Synthetic Aperture Radar (SAR) under Project MICHIGAN, which produced the first high-resolution radar image in August 1957.

Willow Run Laboratories later became the Environmental Research Institute of Michigan (ERIM), which excelled in the development of sensors, the understanding of sensor phenomenology, and associated products and services. ERIM became recognized as a national asset for overhead remote sensing. Its customer base included the Department of Defense (DoD), National Intelligence organizations, National Aeronautics and Space Administration

³ *Aerospace Industry Association of Michigan*

⁴ *Aerospace Industry Association of Michigan*

(NASA), United States Geological Survey (USGS), National Atmospheric and Oceanic Administration (NOAA), and Department of Agriculture (USDA). ERIM's understanding and use of Synthetic Aperture Radar (SAR) was unparalleled as was its understanding of LiDAR, Electro Optical, Infrared, and other sensors. These capabilities remain relevant today especially in support of monitoring the Earth and natural environments.

Over the last twenty-five years, new companies have been launched and national companies wishing to bolster their position in remote sensing have opened branch offices in the Ann Arbor area. As a result, many remote sensing companies and educational institutions now exist within Michigan; these entities form the foundation for the space ecosystem in Southeast Michigan.

With its strong legacy in space, the University of Michigan recently established a strategic plan for space-related research. This plan included the establishment of a Space Institute as the central focal point of space-related research within the University with key participants including:

- Climate and Space Sciences and Engineering (CLaSP) is a preeminent organization performing space research. CLaSP evolved out of the Atmospheric, Oceanic, and Space Sciences Department
- The Space Physics Research Laboratory has performed over 100 rocket, aircraft, and balloon experiments and has developed over 35 space instruments.
- Aerospace Engineering
- Physics
- Astronomy
- Electrical Engineering and Computer Science

Regarding advanced degrees, the University of Michigan has world renowned programs in Aerospace Engineering, Electrical Engineering and Computer Science, Physics, and Astronomy among others. Graduates of each program are highly regarded and well sought after by organizations throughout the world. Other programs exist at Michigan State University and Michigan Technological University. Finally, several communities throughout the state are creating space operations certificate programs. These include Chippewa County Economic Development Corporation, Lake Superior State University, and Bay Mills community College.

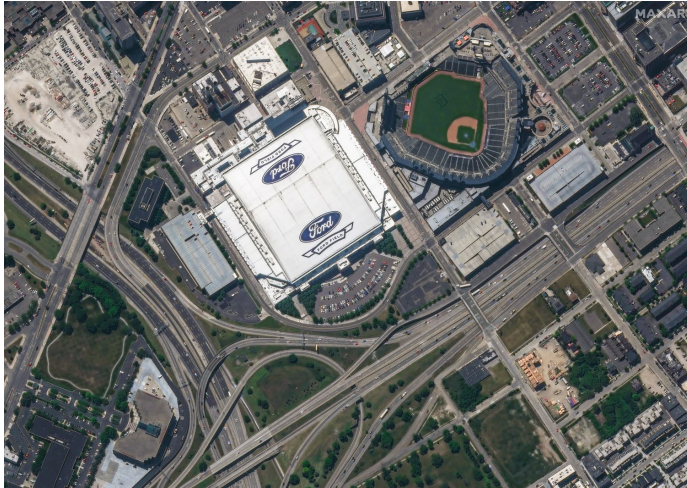


Figure 2: Electro-optical image of Detroit's Ford Field and Comerica Park. Satellite image © 2024 Maxar Technologies



Figure 3: SAR X-Band image of the University of Michigan Stadium collected by Maxar Intelligence's Data Collection System (DCS) testbed at 1ft resolution. Copyright 2024, Maxar Mission Solutions, Inc

B.3 Michigan's Space Industry

The space ecosystem in Michigan has grown as more organizations have taken root with a business in the Space Economy. In developing this report, approximately 35 key assets were identified that are engaged with a primary (or very significant) focus on the Space Economy. And undoubtedly there are more, however within the scope and timeline of development of this report, this is the number that was able to be identified and verified. Michigan's space sector ripples out through tier entities in research, development, and manufacturing.

In addition, it should be noted that adjacent to "pure" space focused assets, the broader aerospace and defense sectors within Michigan certainly play a role and/or can play a role as space segment activities continue to advance. Based on MEDC data, Michigan is home to an overall manufacturing base of over 12,000 companies. Nearly 4,000 of these are already members of the defense industrial base, and as noted prior, more than 900 are within aerospace. This second-to-none concentration of manufacturing capability is one that (and we believe in an even more impactful way) contributes to the overall Space Economy via growth of existing space manufacturing, or via a diversification of customer sector portfolios. To better understand this, it is recommended that as a follow-on effort to this report, a secondary effort should be commissioned to understand the breadth-and-depth of space-related manufacturers in Michigan across tiers.

Furthermore, while commercialization of the market continues to drive private-sector opportunity, there remains opportunity in the public sector as well as with Federal agencies. Focusing on NASA alone, during FY18-FY23, Michigan captured \$235.6M in funding from NASA. This of course does not include other agencies who also led opportunities focused on space-related technologies and development, which would have added to this sum.

To capture key space assets within Michigan, an asset map that provides information on the entities within Michigan whose predominant operations are in support of the space industry.

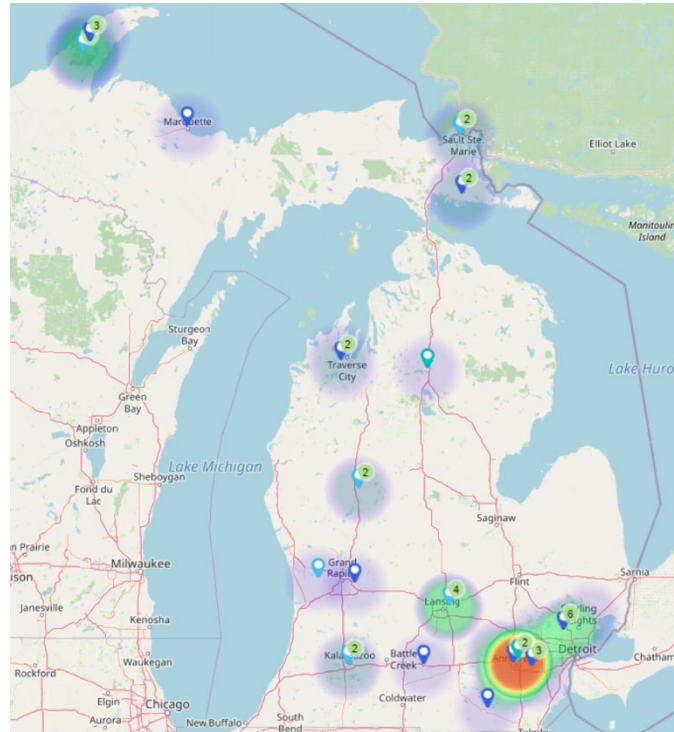


Figure 2: A snapshot of Michigan's key space assets.

https://app.mapline.com/map/map_4b0619c3/d1Z5V0hXdVluSUkrM3BRcXRwRFdReWtDS1htQUhqa2VOWkVUWV. Hovering over each entity on the map provides detailed industry information such as entity name, location, website, year founded, category, number of employees, and leadership.

A heat map is also presented as another filter on the asset map. The heat map captures the density of organizations within a 20-mile radius of the location/city. Halos are used to represent each 20-mile radius. The halos on the heat map turn from blue to red as the number of organizations within a 20-mile radius increases. Figure 4 shows the complete map of all the organizations involved in the space industry in Michigan. A strong concentration exists around Ann Arbor (red halo). A moderate number of organizations exist in the Macomb County, Lansing, and Houghton areas (green halos).

The strength of Michigan universities supporting the Space Economy can be measured in the number of engineering students graduating from the universities and, of those graduating engineering students, the number graduating with an Aerospace degree. It can also be measured by the number of laboratories and Institutes that each university maintains to perform space research. Table 2 addresses the number of engineering students enrolled in Michigan universities. Of those engineering students, 484 undergraduates, 203 master’s level, and 111 PhDs are pursuing degrees in Aerospace.

Table 2: Estimated 2023 Engineering Enrollment in Michigan Universities.

| University | College | Undergraduates | Masters | PhD |
|----------------------------------|----------------------------------|----------------|---------|------|
| Michigan | Engineering | 8104 | 2148 | 1854 |
| Ferris State | Business | 35 | 20 | |
| Michigan State | Engineering | 6100 | 900 | |
| Wayne State | Engineering | 3500 | | |
| Michigan Tech | Engineering | 3386 | 396 | 236 |
| Eastern Michigan | Engineering and Technology | 1981 | | |
| Western Michigan | Engineering and Applied Sciences | 1838 | 336 | |
| | | | | |
| Total Engineering | | 24909 | 3780 | 2090 |
| Total Aerospace Estimated | | 484 | 203 | 111 |

Figure 5 provides a heat map of the Michigan universities with engineering programs and the density of university laboratories and Institutes performing space research. The University of

Michigan has a rich history in performing space research as shown in the Figure. Michigan State University (MSU) also has several research activities involving space research.

The strength of the Southeast Michigan space industry is shown in Figure 6. An impressive number of businesses, University laboratories, and Institutes operate within this region. These organizations make up a space cluster as they draw students and employees from the pool of talent in the area. The cluster is focused around Ann Arbor where a predominant number of Michigan’s space industry companies are located. Moving eastward, General Motor’s work with Lockheed Martin on development of the Lunar Rover is captured in the activity in the Sterling Heights and Macomb County area. MSU’s laboratories around the Lansing area form the Northwest portion of this cluster.

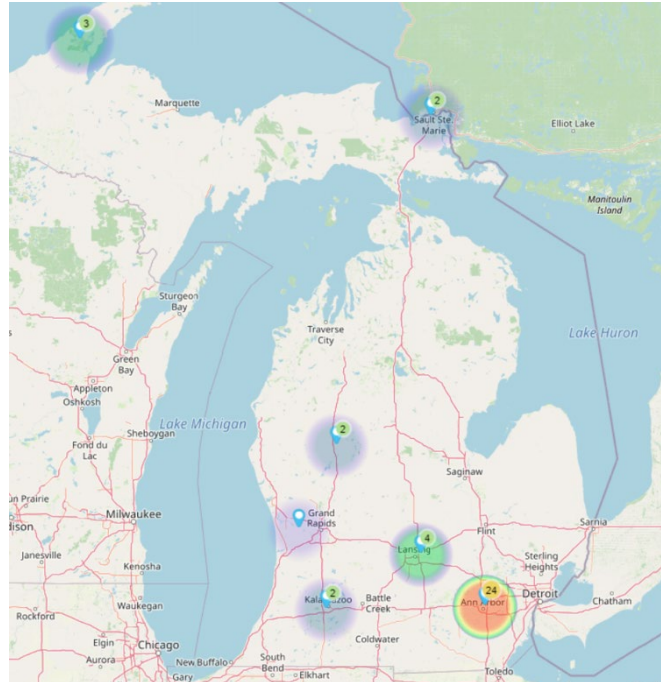


Figure 3: Heat map of the number of laboratories and Institutes performing Space research.

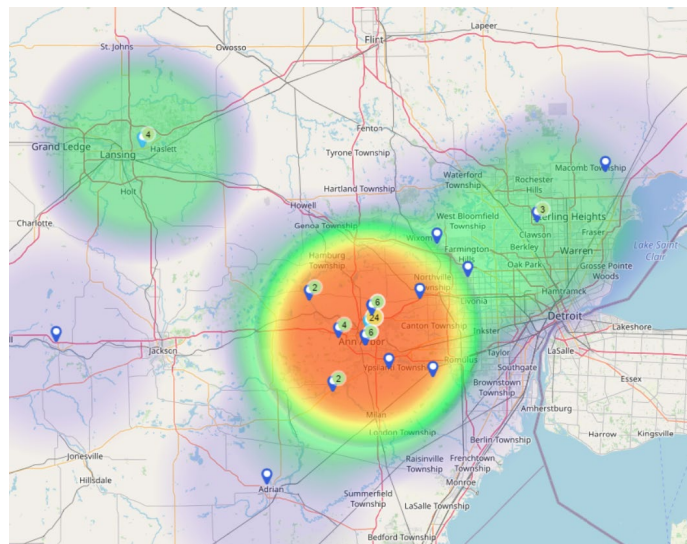


Figure 4: A depiction of the strength of the Southeast Michigan Space cluster.

Finally, it is worth noting that the Upper Peninsula of Michigan is active in the space industry as shown in Figure 7. Michigan Technological Institute and Lake Superior State, as well as several

businesses such as, Kall Morris, Orbion, Calumet, and Geojump all reside in Northern Michigan and make up the Northern Michigan space cluster.

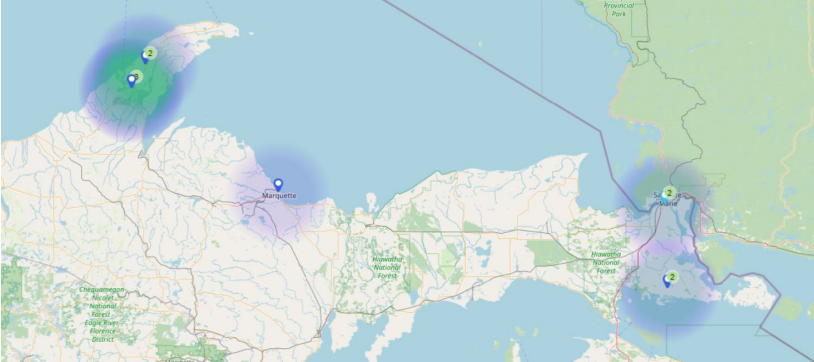


Figure 5: Space activity in Michigan's Upper Peninsula.

C. A Strategic Plan for Michigan

The following Space Strategic Plan builds upon the current strengths of the Michigan space ecosystem by identifying growth opportunities within the Space Economy. From an economic development perspective, the Space Strategic Planning Executive Committee addressed the question, “what area(s) within the Space Economy is Michigan well positioned *to pursue and win?*” To answer this question, the Executive Committee analyzed the asset map depicting existing organizations located in Michigan and adjacent industries that offer compelling technology, research, and development that could be leveraged while providing products and services in the space domain. From the Executive Committee’s analysis, the following five space verticals were identified as candidates for pursuing and winning market share in the Space Economy:

- (1) Space Research;
- (2) Remote Sensing;
- (3) Digital Engineering;
- (4) Space Manufacturing; and
- (5) Connected Vehicles and Mobility

Given these five verticals, the Executive Committee investigated the requirements associated with the further economic development for each. The Executive Committee looked at each vertical through the lens of four strategic pillars that can drive economic growth: (1) marketing, promotion, education; (2) ecosystem identification and enhancement; (3) talent cultivation and acquisition; and (4) capital investment.

Each key asset in Michigan participating in the space Industry were then mapped to one of the five verticals as depicted in Table 3. Further, this mapping where Michigan’s space industry is concentrated, regarding the verticals as organizations that provide expertise, products or services in a particular vertical are categorized accordingly. The Executive Committee argued that a nascent space vertical can be defined for Connected Vehicles and Mobility. Autonomous vehicles being developed and tested by Michigan’s commercial automotive sector rely on Global Positioning System (GPS) data and location-specific weather-forecasting technologies, as well as High-Definition Maps derived and updated from high-resolution satellite data.

Finally, the Space Strategic Planning Executive Committee also identified two cross-cutting areas that are paramount to the growth of Michigan’s Space Economy. These are:

- (1) Talent creation, retention, and attraction, and
- (2) Collaboration

C.1 Descriptions of each vertical

The following section describes each space vertical and provides an analysis of the strengths, weaknesses, opportunities, and threats (SWOT) of Michigan organizations compared with organizations in other states. The results are used to identify specific economic development objectives for each space vertical.

Table 3: A mapping of Michigan organizations into each of the five Space verticals.

| | Remote Sensing/ GEOINT | Digital Engineering | Space Manufacturing | Connected Vehicles | Space Research |
|---------------------------------------------|-------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Industry | EMAG iSciences | Altair Dornerworks | Ascent Aerospace Calumet Electronics | Aloft Sensing Dynamic Map Platform | Geolump iQMRI |
| | KBR Leidos MAXAR | Hexagon Manufacturing Intelligence LiveRoads Analytics Quantum Signal | Challenger Communications Orbion Space Technology PlaneWave | LiveRoads Analytics SoarTech | Kall Morris Radar Applications Inc. |
| | Michigan Aerospace Corp M-Vision Quantum Opus | Seimans Digital Industry ThermoAnalytics Virtual EM | Skypersonic, Inc. | | |
| | Radar Applications Inc RF Bistatics Rydberg Technologies SRI International Woverine Radar | Voxel51 | | | |
| Education | | | | | Orions Quest |
| Institutes/ Research Centers | UM Quantum Research Ins. UM CYGNSS Constellation | | UM COMPASS MSU-Fraunhofer CMW | UM Robotics Institute | Michigan Space Institute UM SunRISE Constellation UM ClaSP Center for Space Environ. Monitoring Ferris State–Cntr for Cybersecurity & Data Science Ferris State–Space Cybersecurity Institute MSU Space Electronics Center Facility for Rare Isotope Beams |
| Laboratories | | | UM SPRL Vibration Lab UM SPRL Space Inst. & small sat dev UM SPRL Thermal Vacuum Lab UM SPRL Faraday Cage UM SPRL Electronics Assembly to IPC UM Lurie Microelectronics fab UM SPRL Electronic Design and Assembly | | Michigan Center for Materials Characterization UM Aero PEPL Large Vacuum Test Facility UM Aero–Peach Mountain UM ClaSP Space WX Modeling Framework UM ClaSP Solar Heliophysics Research UM ClaSP UM ClaSP Space WX Modeling Framework |
| Testing | | UM ECE Anechoic Chamber | Michigan Ion Beam Laboratory UM Aero SmallSat techn research and experiential education MSU ECE | | |

Space Research

The university research programs in Michigan are performing exceptional space research with exemplar work in the following key research areas:

- 1) Electric propulsion and plasma engineering and science
- 2) Advanced electronics, AI, cybersecurity, and space weather awareness and effects
- 3) Materials for special use (sensing, quantum), batteries, photovoltaic, meta materials

| Strengths | Weaknesses |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Breadth and depth of the research described above is supported at multiple universities.</i></p> <p><i>Alumni of Michigan institutions are key leaders in government Space agencies (NASA, NSF, DoD), academia, and industry.</i></p> <p><i>The collaboration between research and industry as evidenced by the collaboration between:</i></p> <ul style="list-style-type: none"> • <i>the Ferris State Space Cyber program and Atlas.</i> • <i>UM SPRL development with Orbion.</i> | <p><i>No strong link between research and industry – hard to move research out of universities.</i></p> <p><i>Limited ability to do export sensitive research – EAR, ITAR, Classified.</i></p> |
| Opportunities | Threats |
| <p><i>Talent being developed in Michigan university research programs is relevant to the space industry.</i></p> <p><i>Increased talent exchange between academia and industry.</i></p> <p><i>Companies building R&D operations close to university-led Research Institutes.</i></p> <p><i>Establishment of secure facilities to allow collaborative research between university/industry/government.</i></p> | <p><i>Lack of secure facilities means advanced research programs go to other States.</i></p> |

Remote Sensing

The Greater Ann Arbor area retains the distinction of being a national remote sensing center of excellence with specific expertise in Synthetic Aperture Radar (SAR); much of this work is classified work for the Department of Defense (DoD) and Intelligence Community (IC).

| Strengths | Weaknesses |
|-------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Remote sensing programs at Michigan universities, including the University of Michigan (UofM)</i></p> | <p><i>Talent retention—upon graduation many students, along with some IP, immediately leave Michigan for jobs in other states.</i></p> |

| | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Climate and Space (CLaSP), which operates a NASA constellation for global environmental monitoring⁵.</i></p> <p><i>CLaSP (and other programs) remote sensing Intellectual Property and the excellent cadre of engineers that graduate each year.</i></p> <p><i>The Kellogg Air National Guard Base in Battle Creek is well suited for DoD “space” missions, hosting Sensitive Compartmented Information Facilities (SCIFs) and expertise, e.g., cyber.</i></p> | <p><i>UofM restricting classified research limits major funding opportunities from the DOD/IC.</i></p> <p><i>New workforce being discouraged from taking a job in the space industry due to the time it takes to obtain a security clearance and the delay it causes for them doing meaningful, productive work.</i></p> <p><i>The competition among local companies for the limited pool of talent in Michigan.</i></p> |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

| Opportunities | Threats |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| <p><i>Establish methods for sharing talent through an Increased relationship between industry and universities:</i></p> <ul style="list-style-type: none"> • <i>An “on loan” program enabling recent industry hires to work on university programs for short durations.</i> • <i>Increased coop/intern/mentorship programs.</i> <p><i>Conduct industry/academia-sponsored Challenges for high schools and universities to enhance student awareness of in-state opportunities in the Remote Sensing Industry.</i></p> <p><i>Establish an alternative business approach to perform classified research.</i></p> <p><i>Improve engagements and partnerships focused on defense programs and those engaged in environmental monitoring by increasing the collaboration between Industry-Academia-Government.</i></p> | |

Digital Engineering

Michigan has grown a strength in Digital Engineering through its application in the commercial automotive industry. This strength could be leveraged and applied in the following areas of the space industry:

- Design & Development (CAD/CAM)
- Lifecycle Management (MBSE)—the space centers of gravity are in CO, CA, VA, OH.

⁵ NASA CYGNSS mission is comprised of eight low Earth orbiting spacecraft that receive both direct and reflected signals from GPS satellites. The direct signals pinpoint the satellite position, while the reflected signals respond to ocean surface roughness, from which wind speed is retrieved. These data are used to deduce ocean surface wind speeds in all precipitating conditions, including those during tropical cyclones as well as to support the operational hurricane forecast community by producing and providing ocean surface wind speed data products. [From the UofM College of Engineering website]

- Modeling and simulation—for space the states with the strongest capabilities are in PA (home of AGI ANSYS), CO (gov’t CoG’s with SWAC/SSDP and contractor base), DC Beltway (NRO, contractor base), and CA (Space Systems Command & contractor base)
- AI&T- digital expertise is typically local to manufacturing, but software dependencies may encourage remote support.
- Mission operations- typically located at factory support or ground stations.

| Strengths | Weaknesses |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Mature environment in non-space related industries.</i></p> <p><i>Strong academic pipeline (UM Aero DE program, Naval Arch, and Mechanical; and at other schools like WMU, Michigan Tech becoming interested).</i></p> <p><i>No USG anchor—can propose a new organization from scratch to deal with new problem (DE Innovation Delta under Space Force located at Selfridge w/ KJADIC?)</i></p> | <p><i>Approach is weakened without an anchor USG tenant (DoD or NASA).</i></p> <p><i>Timeliness in pursuing the market other states (e.g. Texas) have been for some time investing State dollars to drive sector growth.</i></p> <p><i>No common secure space facilities; this inhibits commercial growth for start-ups. (Catalyst Campus in CO, Westway in VA are examples)</i></p> |
| Opportunities | Threats |
| <p><i>Combined DoD & NASA detachment / field office focusing on bringing best of breed digital engineering tools and innovations to the space ecosystem.</i></p> <p><i>DE schoolhouse and R&D center—promote public/private cooperation with local industry.</i></p> <p><i>Become an unbiased supplier of capability to multiple centers that have their own proprietary methods.</i></p> <p><i>Established customer support output in Johnson SFC.</i></p> <p><i>Create something to draw contract vehicles within state borders that then will attract industry as part of a Space Force Guard, NASA field office related to Ohio centers, Space Force Delta through STARCOM focused on DE training & R&D, US Coast Guard space center of gravity co-located in SSM with new Sen Peters led Great Lakes Center for Oil Spill Monitoring & Homestead Ground Station.</i></p> | <p><i>Other states lead in some cases are significant (e.g. Ohio anchor tenants & an existing integrated gov’t strategy for attracting and retaining the space industry as well as Texas- perceived positive business climate & emerging state leadership for integrated strategy.).</i></p> <p><i>Growing tech centers for legacy automotive suppliers in AL, TENN could surpass MI’s unique claim to auto R&D.</i></p> |

Manufacturing

Michigan is home to over 12,000 manufacturing facilities, with nearly 4,000 in defense and over 900 within aerospace. It makes sense that Michigan can further leverage this capability and capacity for space manufacturing, given the similarities and/or adjacencies to other sectors within Michigan that manufacture utilizing similar or same manufacturing processes, materials, and standards.

| Strengths | Weaknesses |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Long-standing manufacturing capabilities, facilities, know-how and skills base;</i></p> <p><i>Leading engineering schools and engineer base because of the auto and other manufacturing industries including leading aerospace and space engineering schools.</i></p> | <p><i>Lack of recognition as a State with space manufacturing expertise.</i></p> <p><i>Lack of federal space activities located within Michigan.</i></p> |
| Opportunities | Threats |
| <p><i>The space asset sector is set to grow from >4000 operating satellites to >15,000 by 2030; in addition to the growth in satellites and related parts and components, there are many other types of space assets that will be located on Earth and on the moon; all of them need to be manufactured.</i></p> | <p><i>Loss of Michigan talent (e.g. to other states and/or industries.</i></p> |

Connected Vehicles and Advanced Mobility

Michigan's strength in this vertical is tied to the commercial automotive industry. There exists the opportunity to explore this and understand transferability of automotive capabilities and techniques to the space sector. Specific business areas in this vertical that relate to the Space Economy include such things as communications to vehicles with real time weather and road information, High-Definition Maps derived from satellite imagery for autonomous vehicles, and, just now coming into reality, 3D maps from satellite imagery to guide autonomous flying vehicles.

| Strengths | Weaknesses |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p><i>Low cost / high volume solutions</i></p> <p><i>Significant investment (i.e. GM invested \$35B in new technologies such as AI, Electrification, Connected Car, and Autonomy).</i></p> <p><i>Power, electrification, batteries, fuel cells and related controls, electronics and subsystems are specific strengths and are the best candidates for adoption to space.</i></p> | <p><i>Low Volume Military / Space applications are not a high priority for automotive given scale they prefer.</i></p> <p><i>Business case in military and space not attractive for large high volume automotive.</i></p> |

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| <p><i>Advantages in time in market and customer data (i.e. OnStar is the oldest and largest connected car system in the world).</i></p> <p><i>Local ecosystem of OEM's and Supplier Industry, Government Contractors, GVSC, universities and community colleges provide a large talent base to draw from.</i></p> <p><i>Satellites to support vehicle connectivity on Earth in a Space-to-Vehicle application.</i></p> <p><i>Terrestrial vehicle autonomy on the moon, but not on spacecraft navigation solutions.</i></p> <p><i>Facilities already in place and funded.</i></p> | |
| Opportunities | Threats |
| <p><i>Parts of vehicles of the future have applicability to space such as batteries, AI, satellite link to vehicle, connectivity.</i></p> <p><i>Encourage research and subsidize the effort to kick start the initiatives and encourage collaboration.</i></p> | |

C.2 A Space Strategy for Michigan

The major premise of the strategy is that a highly qualified and respected workforce will lead to Michigan’s growth in the Space Economy. A workforce that customers seek out to solve challenging problems and that creates new, innovative products will result in the capture of significant portions of a market. This premise is the focal point for the Michigan Space Strategy and each strategic initiative provided below touches on it. It focuses on creating an environment that provides: (1) opportunities for career growth by working and solving compelling problems; and (2) the resources required for establishing an exciting entrepreneurial environment.

The following initiatives are recommendations towards growing, retaining, and attracting talent to grow Michigan’s Space Economy. A description of the value of each initiative is provided as well as near- (0-1 Year), mid- (1-3 years), and far-term (beyond 3 years) actions to promote these initiatives. Further, specific actions are selected from the list of near-term actions and provided as immediate recommendations for State investment.

In addition to the below, as an overarching economic development initiative it is recommended that the MEDC take inventory of current talent and business development programs, tools, and resources, and identify where and how these resources may also be applied towards space-sector opportunities. By example, in addition to ODAI, MEDC’s Regional Prosperity Team, Business Attraction Team, Talent Team, Market Growth Team, Pure Michigan Business Connect Team, and associated programs, should be engaged and

deployed as appropriate in support of space-sector-based initiatives and opportunities. Ideally this will inherently drive core business attraction and growth activities in parallel with the below recommended initiatives.

Strategic Initiative 1: Establish a Unity of Purpose for Growing a Space Economy in Michigan

A successful space initiative in Michigan requires coordination among a State’s Executive Office, State Economic Development Agency/Department of Commerce, Federal and State legislatures, regional and local economic development partners, industry, and academia. This coordination is a foundational requirement from which Michigan’s Space Strategic Plan must begin.

Michigan’s Congressional Delegation (CODEL) can provide support in; (1) securing space related funding, (2) securing a tenant customer in the state, and (3) helping to bring a space mission with active-duty personnel to the state. While the CODEL works to develop federal business opportunities, the State’s Executive Office and State Legislature will need to consider business incentives and market them to industry and government organizations. Meanwhile, Industry and academia bring the knowledge of the space domain and will ensure that their needs are well represented.

As a near-term action, it is recommended that a coalition business model be established in Michigan like those used in Colorado and the St. Louis Region. The coalition model focuses on two core thrusts—establishment of a Space Coalition, with a diverse and inclusive membership spanning State Government, Industry, and Academia; and a space business roundtable that is more internally focused on STEM and matchmaking between small, medium, and large businesses. Specific responsibilities might include:

MEDC & Office of Defense & Aerospace Innovation: lead and/or coordinate execution of the Space Strategic Plan, implementation of business incentives, branding and brand recognition, talent incentives, business attraction, retention, growth. Establish and/or maintain coordination across State of Michigan agencies & offices including DMVA, LEO, OFME, and others as appropriate.

Educational Institutions: workforce development, execution of space related technical Challenges, conferences.

Industry: design, build and maintain space related products and services.

Congressional Delegation: brand recognition, development of federal opportunities, and help to bring a space mission with active-duty personnel to the state.

Venture Capitalists: Monetary support for startups in remote sensing and later, in other domains.

Short Term Actions

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| Unity | Borrowing from other state’s initiatives, organize a Michigan-based space coalition and a space business roundtable. Use these organizations to leverage relationships of graduates from Michigan universities that now hold positions in government offices with an interest in Space (AFRL, NASA, NSF, DARPA, etc.). |
| Unity | Establish a business roundtable focused on the remote sensing ecosystem to improve Industry-Academia-Government engagements and partnerships; pursue collaboration between entities focused on defense programs and those engaged in environmental monitoring programs. |
| Unity | Enhanced connection with the 10 regional APEX Accelerators, which help Michigan businesses pursue and perform under contracts with the government, and local university faculty to facilitate improved Small Business Innovation Research (SBIR) grant shaping for all space-focused government agencies (DoD and Civilian). |
| Unity | Assist connecting small businesses to customers both in support of sales pipeline as well as supply chain development within Michigan. |

Mid Term Actions

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| Unity | Collaborate with the state’s international trade team to develop and/or identify resources to address industry with export control issues. |
| Unity | Work with Michigan institutions to develop an executive education program, with a focus on the Space Economy for the leaders of Michigan space companies focusing on the Space Economy. |

Strategic Initiative 2: Create, Retain, and Attract the Talent requisite for a Vibrant Space Economy in Michigan

Arguably the most critical strategic initiative; talent creation, retention, and attraction can only succeed if individuals are provided the right educational programs, the right resources, and the right environment. The right educational programs are critically important and must exist at the K-12 and college levels. This requires a strong Science, Technology, Education and Math (STEM) curriculum tailored to include classes related to space in both K-12 and college levels. Regarding resources, employees who seek exciting projects that provide opportunities for continued professional development and salaries that are competitive with those offered in other states. Finally, the environment needs to provide the right tools and data to allow the talent to create, build, and innovate. This will make Michigan a destination state for newly graduated and existing Aerospace professionals.

As immediate actions, it is recommended that the Space Economy join with other talent initiatives in Michigan to enhance the educational programs for K-12, community colleges, and university programs that focus on educating individuals interested in pursuing careers associated with the Space Economy. Toward this end, two specific recommendations worthy of immediate action are:

- Establishment of a Space Challenge program for Michigan students. Visitors from commercial industry and federal government would be invited to observe the Challenge and, in some cases, to act as judges. A byproduct of the Challenge is increased recognition of the capabilities of our state’s resources—both with regards

to the workforce and regarding the operational domains. Examples of existing Space Challenges include:

- National Security Innovation Network (NSIN) Hacking for Defense (H4D) Challenges, <https://www.h4d.us> NFTE WSI Challenges, Climate Mapping, <https://innovation.nfte.com>
 - Network for Teaching Entrepreneurship (NFTE) World Series of Innovation (WSI) Challenges, Climate Mapping, <https://innovation.nfte.com>
 - SpaceNet, https://medium.com/@SpaceNet_Project/the-spacenet-8-flood-detection-challenge-announcing-the-winners-c74d4619195b Omedena AI Assisted Collaborative Mapping Tool for Disaster Management
- Using the highly successful First Robotics as a model, it is recommended that the state of Michigan begin a First Space program. First Space could use a format like GIS Day that originated through sponsorship by ESRI. GIS Day “helps students learn about geography and the real-world applications of GIS that make a difference in our society. It’s a chance to share your accomplishments and inspire others to discover and use GIS.” See, <https://www.gisday.com/en-us/overview>, for more information.

Short Term Actions

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| Talent | Host technical Challenges focuses on space that introduces students to solving challenging problems relating to space. Conduct a space analytics Challenge using measurements from space assets. Remote Sensing Challenge focuses on the patrol of our borders. |
| Talent | Through industry/academia-sponsored Challenges in high schools and universities, increase student awareness of in-state employment opportunities in the Remote Sensing Industry. |
| Talent | Create a recruiting website. Track high school and college students that graduated from Michigan institutions (see Michigan Space Grant). |
| Talent | Set up an intern program for 11-12 grades, Fr-So university level, where students rotate through industries within Michigan for two-week intervals. |

Mid Term Actions

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| Talent | Highlight existing academic programs in Michigan that are focused on the space industry (for example UMich M.Eng Space Systems; WMU & MTU electric propulsion programs; LSSU Space Operations Certificate Programs; UMich Digital Engineering x88 program, MSU Space Center). |
| Talent | Increase the talent exchange between academia and industry by: <ul style="list-style-type: none"> ● sponsoring internship programs, and ● bringing alumni back to universities for advanced degrees for qualifying companies (local facilities, local suppliers, etc.). |
| Talent | K-12 education. Establish space education program in K-12 curriculum. Perhaps use Michigan Science Teachers Association. |
| Talent | K-12 education. Start early with the progression of math classes (e.g., algebra, trigonometry, calculus, statistics) in grades 5-12 to prepare students for engineering programs; establish an integrated framework through all levels of education to build the workforce of the future. |

Far Term Actions

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| Talent | Establish a State-run Tuition Reimbursement Program encouraging graduates to stay in Michigan |
| Talent | Establish a marketing campaign promoting the Space industry in Michigan to increase student awareness of in-state employment opportunities and enhance recruiting efforts to attract experienced, out-of-state employees to Michigan. |

Strategic Initiative 3: Marketing and Branding

Michigan needs to establish its brand as being an active and significant participant in the Space Economy for the other initiatives of this Space Strategic Plan to succeed. Michigan needs a “branding” such as having a favorable business climate, having the requisite talent, and able to provide products and services relevant to the Space Economy. This requires a multifaceted marketing campaign that includes—creating a Michigan Space story, increasing our presence at key space conferences and marketing events, being invited to participate in key professional organizations, and establishing methods to promote Michigan’s story.

Short Term Actions

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| Branding | Improve outreach through participation in space related associations, identifying where we need to be, when we need to be there, and what we need to be saying. |
| Branding | Attend key space related meetings and conferences such as the Aerospace States Association (ASA) annual meeting and State Aerospace Policy Symposium. |
| Branding | Develop a Michigan Space Website that acts as a focal point of information capturing all space related activities occurring in Michigan. The website could include: <ul style="list-style-type: none"> • The Michigan Space Asset Map • Job opportunities • Academic programs offered by Michigan’s universities and community colleges. |

Mid Term Actions

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|-----------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Branding | Identify a topical area for which Michigan is uniquely positioned and can host an annual conference on that topic. |
| Unity | Develop an executive education program within one or more of Michigan’s universities, that focuses on educating executives of organizations participating in the Space Economy. |

Strategic Initiative 4: Establish Innovation Hubs to encourage growth in the Space Economy

Grow Michigan’s presence in the Space Economy through the establishment of Innovation Hubs—aligned to targeted space verticals—that bring the right resources and to provide the right environment to individuals working in the Space Economy. A hub is a physical, central location for technology innovation and a key attractor of talent. Hubs provide a dynamic and exciting environment for creating new ideas, new products, and new businesses by providing networking opportunities for businesses, academia, private equity, and talent. Borrowing from

Ann Arbor SPARK and Fords Innovation District, hubs will strengthen Michigan's space offerings by supporting an entrepreneurial culture focusing on the creation of space related businesses, products, or services. Hubs include supporting the growth of ecosystems already in place in verticals such as space research.

The proposed actions for establishing Innovation Hubs would create the requisite infrastructure, provide start-up services, and provide services for promoting professional growth for its users. Physical infrastructure includes offices, meeting and collaboration spaces, laboratories, telecommunications, and equipment. It may also provide unique capabilities that are associated with a particular customer. For instance, an Innovation Hub for Measurement and Analytics might include a Secret Compartmented Information Facility (SCIF) for working on Federal Government projects. It may also provide data bases that can be used for the development of analytical tools or applications.

Startup services are often provided at Innovation Hubs as they often act as a central focal point for entrepreneurial activity within a region. These services include entrepreneurial training including workshops and classes on leadership, how to run a business, budgeting, marketing, and customer support. Startup services may also provide access to state and local incentives, and access to finance. Finally, the services may also include talent acquisition through job postings and employment boards and networking events.

A final benefit of Innovation Hubs are the services provided regarding the development, growth, and retention of talent. It acts as a professional focal point for the individuals that utilize the hub. The services provided include training programs, guest presentations, networking, and social events. It may also provide student intern programs matching future graduates of space related programs with businesses that run the gamut from large to small startups. The Innovation Hub may provide development talent through the execution of technical Challenges and technical demonstrations.

As a near term action, it is recommended that Michigan establish Innovation Hubs (and/or explore partnerships with existing assets such as the SmartZone Network) for remote sensing, space research, and digital engineering.

Remote Sensing Innovation Hub. The benefit of this Innovation Hub is that it would stimulate the creation of new products, expand upon a rich talent base, and create stronger relations with academia.

Space Research Innovation Hub(s). A benefit of the Research Innovation Hubs is their capability to enhance collaboration between academia and industry. This collaboration may lead industry into establishing transition laboratories near universities with substantive space research activities (UofM, MSU, FSU, LSSU). Further, these transition laboratories can provide a dynamic environment for the exchange of research and talent. Examples of already existing academic, industry collaboration include:

- Ferris Space Cyber program partnership with Atlas
- UM SPRL development with Orbion

Other research areas focusing on Academia/Industry collaboration include:

- Electric propulsion and plasma engineering and science
- Advanced electronics, AI, cybersecurity, and space weather awareness and effects, and
- Materials for special use (sensing, quantum, others), batteries, photovoltaic, meta materials

Digital Engineering Integration Center Innovation Hub. The benefit of this Hub is that it borrows from the regional experience maintained in the adjacent automotive ecosystem to create competitive Digital Engineering products and services for space.

| Innovation Hub | Short Term Actions |
|---------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote Sensing | Establish a space Remote Sensing Innovation Hub in Southeast Michigan. |
| Research | Increase talent exchange between academia and industry through: <ul style="list-style-type: none"> • Sponsored coop/intern/mentorship programs between academia and industry; and • Bring alumni back to universities for advanced degrees for qualifying companies (local facilities, local suppliers, etc). |
| Research | Overcome the “personnel on the bench awaiting clearance” problem by establishing an industry-to-university “on loan” program that enables recent industry hires to work on university programs for short periods of time. <ul style="list-style-type: none"> • Establish a compensation package using a combination of funds provided through university grants, industry Internal Research and Development (IRAD), and state educational incentive programs. |
| Digital Engineering | Establish MiNG “Digital Engineering University” at Selfridge KJADIC. |

| Innovation Hub | Mid Term Actions |
|---------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Remote Sensing | Explore creation of grants focused on measurement and analytics using data and information acquired through measurements from space based resources. |
| Research | Establish a separate National Center for Remote Sensing, using the Federally Funded R&D Centers (FFRDC) model (consider the UARC model), with an appropriate Federal Agency as the sponsor. |
| Digital Engineering | Establish a Digital Engineering schoolhouse and R&D center—promote public/private cooperation with members of Michigan’s industrial base. |
| Digital Engineering | Explore establishment of a combined DoD & NASA detachment/field office focusing on bringing best of breed digital engineering toolsets and innovations to the space ecosystem. <ul style="list-style-type: none"> • By not attaching to a single NASA center, an unbiased supplier of capability can be provided to multiple centers over their own proprietary methods. |

| Innovation Hub | Far Term Actions |
|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Research | Implement incentives for companies to build R&D operations close to university-led Research Institutes <ul style="list-style-type: none"> • State funding to supplement research park construction nearby. • R&D tax credits for collaborative work between academia and industry. |
| Research | Establish secure facilities to allow collaborative research between university/industry/gov't. <ul style="list-style-type: none"> • Provide help getting facilities up and running CUI/classified assistance (like Digital Engineering recommendations). • Establish cooperative facilities outside of the university to allow arms-length relationship for university administration –UARC, FFRDC, or other considered emerging areas such as space weather, electric propulsion/plasma research. |

Potential Future Hubs. For the Manufacturing, and the Connected Vehicles and Advanced Mobility Innovation Hubs it is recommended that the commercial automotive work underway in both these communities be leveraged.

| Innovation Hub | Short Term Actions |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Manufacturing | Connect with Society of Manufacturing Engineers to flesh-out the requirements associated with providing manufacture support for the Space Economy. |
| Connected vehicles and mobility | Need to define a business case for connected vehicles and advanced mobility in space. <ul style="list-style-type: none"> • Need to define mobility as it pertains to the Space Economy. Define the approach for using connected vehicles technology for space assets. |
| Connected vehicles and mobility | Leverage the American Center for Mobility (ACM) and MCity as examples for what can be done to support the Space Economy. |

| Innovation Hub | Mid Term Actions |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Connected vehicles and mobility | Investigate locations for an Innovation Hub for connected vehicles and advanced mobility. <ul style="list-style-type: none"> • Explore existing assets such as but not limited to ACM, then investigate the use of automotive proving grounds. |

Strategic Initiative 5: Strengthen Michigan’s space ecosystem by establishing or strengthening regional clusters throughout Michigan

Regional clusters are concentrations of related industries that consist of companies, suppliers and service companies, academia, and government agencies that recognize a business

advantage while operating close to one another⁶. Each cluster may include organizations working in one or more of the verticals. For instance, a Southeast Michigan space cluster might include organizations working in academic research, remote sensing, digital engineering, connected vehicles and manufacturing.

Clusters supporting other industries have existed in Southeast Michigan for some time. Two of the more prominent clusters are the commercial automotive and Detroit Arsenal clusters. Each Cluster consists of organizations that design, develop, and field ground vehicles—the commercial automotive provides retail vehicles to consumers and the Detroit Arsenal provides vehicles to the DoD and Allied forces.

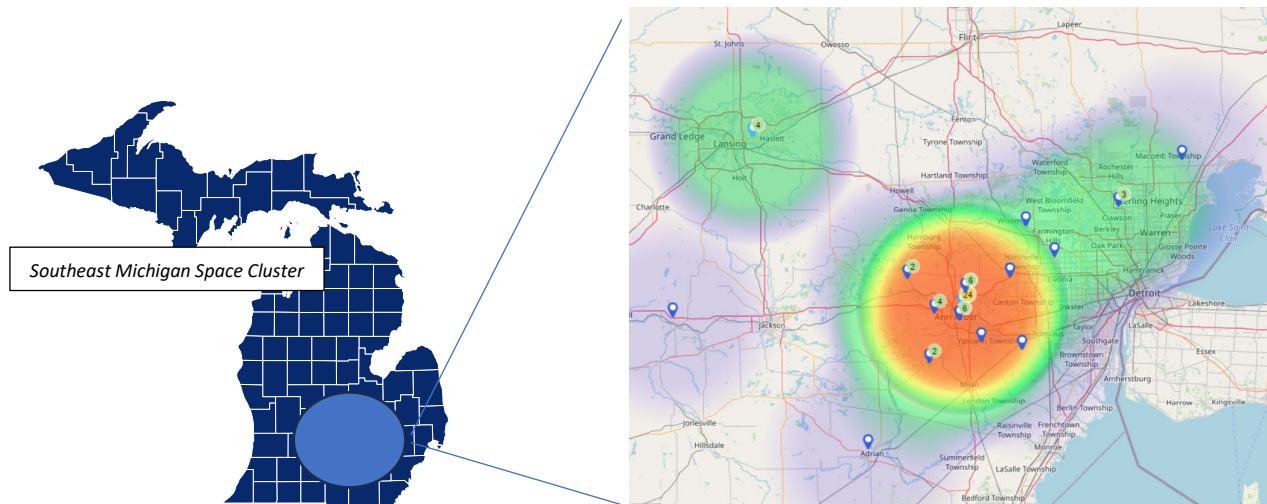


Figure 6: Depiction of the Southeast Michigan Space Cluster. The geospatial map on the right shows that the many organizations that make up this Cluster.

Short Term Actions

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| Clusters | With the assistance of the Michigan’s Economic Development Collaboratives, formalize the ad-hoc space cluster(s) in Southeast and Northern Michigan through the establishment of regional Space Economic Development Offices. |
| Clusters | Encourage the growth of the Southeast Michigan Cluster, which has the most established space ecosystem in the state. It includes the counties of Wayne, Washtenaw, Oakland, Macomb, Livingston, and Ingham. Establish a Southeast Michigan Cluster roundtable that includes key organizations from industry, academia, and government. |
| Clusters | A handful of companies exist in the UP that work in the space domain. Provide state investment in Northern Michigan Cluster to enhance small scale physical infrastructure (<\$1M) that can attract academic dollars and start-up industry. <ul style="list-style-type: none"> • Static rocket test facility, exploring existing assets first to support |

⁶ Slaper, T., Ortuzar G., “Industry Clusters and Economic Development”, *Indiana Business Review*, Spring 2005, Vol 90 No 1.

- Next generation ground station test campus

III. FY2026 Lines of Effort

1. Advance Ongoing FY25 Initiatives

1.1 ODAI Space Community of Interest (COI)/ODAI Space Forum

- 1.1.1 This group has grown from 33 members at the outset of campaign execution in FY25 to 115 members presently, representing Michigan’s industry, academia, non-profits, and others, as well as out-of-state members that maintain significant interest in the advancement of Michigan’s space economy.

1.2 Michigan Space Innovation Hub

- 1.2.1 A cornerstone initiative, deploy and resource an RFP to initiate launch of the Michigan Space Innovation Hub

1.3 MiSpace Challenge Hackathon

- 1.3.1 Execute inaugural MiSpace Challenge Hackathon in Q1 of FY26

1.4 Marketing Campaign

- 1.4.1 In alignment with overall ODAI marketing campaign, maintain partnership with MEDC Marketing Team to advance space-sector-specific marketing assets

2. Advance Michigan—Based Manufacturing for the Space Economy

2.1 Asset Map Existing Michigan Manufacturing Base

- 2.1.1 Bolster Michigan space ecosystem asset map by further identifying existing space manufacturing suppliers within Michigan as to enhance ability to market and support Michigan’s current supply base

2.2 In-Space Assembly and Manufacturing (ISAM)

- 2.2.1 Assess in-space assembly and manufacturing (ISAM) opportunity(ies) specific to Michigan, and develop a plan of action for opportunities identified, if any

3. Ecosystem Support & Tools Deployment

3.1 In-Market Support for Industry & Ecosystem Partners

- 3.1.1 Identify core domestic and/or international industry trade event(s) that would be the most relevant and impactful for ODAI and MEDC to apply resources to support. This could take the form of International Trade Program resources, ecosystem delegation support/coordination, and/or deployment of a State of Michigan Pavilion

3.2 Lower Barriers to Market Entry and/or Diversification

- 3.2.1 Leverage forthcoming ODAI *Certifications Grant Support Program* and Apply to Michigan Space Ecosystem (target resource provision for market-specific certifications such as AS9100, CMMC, ITAR, etc.)
- 3.2.2 Leverage forthcoming ODAI *Proposal Writing Services Grant Program* and Apply to Michigan Space Ecosystem (target resource provision to ecosystem partners seeking to submit federal contract/grant proposals focused on space)

3.3 Additional Partnership Exploration & Development

- 3.3.1 Further explore existing and/or new partnerships locally, domestically, and/or internationally that can Advance Michigan's Space Economy
 - 3.3.1.1 Partner with Michigan National Guard (MING) to promote industry & academia utilization of key MING assets and initiatives [to include but not limited to the National All Domain Warfighting Center (NADWC), Northern Strike]

4. Pursuit of Federal Space Activity and Presence in Michigan

4.1 Identify and Assess Courses of Action to Pursue and Capture Agency Engagement

- 4.1.1 For example – engagement with DIU, AFRL, AFWERX, SpaceWerx, NASA, NRO, Space RCO etc. regarding expanding presence within Michigan
 - 4.1.1.1 Explore partnership with MING as a part of a whole-of-ecosystem approach