



Space-Enabled Connectivity for Advanced Mobility

Our Plan to Create a Research and Innovation Network
for SECAM in Michigan to benefit the Nation

JANUARY 2023

Introduction

Michigan Aerospace Manufacturer's Association (MAMA) is seeking to implement emerging and transformative technologies throughout Michigan's infrastructure that will fuel the next generation of industrial and automotive technology in the State.

In doing so, we believe that Michigan can continue building upon its historic legacy of automotive leadership in the United States and globally, while advancing critical local industries that will enable the state to grow jobs, expand businesses, and evolve its infrastructure.

We believe that this effort is best structured through a long-term, well-resourced non-profit entity that is co-sponsored by state-level and federal-level agencies, and is comprised of cross-sector organizations, from academic institutions to commercial enterprises. We envision this structure of this entity as a research and innovation network for space-enabled advanced connectivity for advanced mobility, otherwise referred to as the SECAM Research and Innovation Network (RIN).

To formulate our plan for the creation of a SECAM RIN for research, development, testing, and evaluation (RDT&E) and commercialization efforts in Michigan, we have consulted over 50 automotive and mobility, space, systems engineering, and economics experts to understand our imperatives, formulate the SECAM RIN concept, and outline our ambitions. In addition to the experts, we consulted over 30 American companies and organizations, ranging from small businesses to industry stalwarts to ensure that we were capturing the diverse views from across multiple industrial bases and ecosystems.

Next, we invited public commentary on the SECAM concept through industry engagement at the 2020 and 2021 North American Space Summits, the 2021 NewSpace Industrial Base seminar, and 2021 Space Symposium.

Simultaneously, we commissioned a third-party report in the summer of 2021 to outline:

1. The Business Imperative for Advanced Connectivity Solutions for Advanced Mobility (ACAM)
2. Future views for Advanced Connectivity (AC) and Advanced Mobility (AM)
3. The value proposition for SECAM to understand how space-enabled connectivity can generate economic growth
4. Recommendations for the development, implementation, and operationalization of the SECAM RIN
5. Recommendations on targeted time horizons for the RIN
6. The ability to leverage existing government-sponsored research consortium constructs to establish the SECAM RIN
7. Overall recommendations for the establishment of the SECAM RIN including the consortium model and proposed RIN member organizations
8. An overview of targeted technologies, industries, and functions that the SECAM RIN should address

MAMA believes that we are the right organization to accelerate ACAM technologies and capabilities for the nation. Our plan is shovel-ready today, backed by extensive industry insight and expertise, and validated through third-party analysis of the current technical and market landscape. Furthermore, we understand the need to incentivize and accelerate open and interoperable solutions that do not create monopolies or government-owned, government operated solutions.

We believe that our vision for tomorrow is complimentary to the ambitions of the commercial aerospace, domestic automotive, and national telecommunication industries as well as the public and private investment into 5G, space launch services, satellite communications, automobile electrification, and advanced mobility applications. We are ready to bring this journey towards tomorrow today.

Investment Ready Today, for Tomorrow's Future

Mobility via autonomous vehicles (AV) will deliver economic, environmental, and social benefits that will transform our society. The key challenges facing adoption of AV are: 1) communication between vehicles (to avoid collisions), and 2) communication between AV and infrastructure in suburban and rural communities (to stay on the road).

Leading industrialists foresee high-speed data links between constellations of low Earth orbit (LEO) satellites and fleets of AV's. For example, Space Exploration Technologies' Starlink Constellation will provide 5G-like data links for the Tesla line-up of AV's.

Despite their historical dominance of the American automotive industry, Detroit automakers currently trail behind California technology companies in the field of AV 5G data links - advanced connectivity for advanced mobility (ACAM). Allowing this gap to continue and grow is an existential threat to Detroit automakers, their suppliers, and thus to the economic future of Michigan.

To ensure Detroit automakers become the epicenter of ACAM development and deployment, we must establish a collaborative working group of space technology companies, automakers, and innovators dedicated to creating a common capability and standards for ACAM.

Our vision is to establish this collaborative working group as a research and innovation network (RIN) for space-enabled connectivity for advanced mobility (SECAM) that is initially established a center of excellence within the State of Michigan to accelerate technology development efforts to bring advanced connectivity services to advance mobility solutions through accelerated research, development, testing, evaluation, and commercialization efforts.

This vision implements the current policy priorities around connected infrastructure and autonomous technologies under Governor Whitmer's Executive Directive 2020-1 and the creation of the Michigan Office of Future Mobility and Electrification. The vision also has the benefit of facilitating the expansion of rural broadband capabilities, which the state of Michigan has prioritized recently through the Connecting Michigan Communities program, and which the federal government is incentivizing through various initiatives.

To realize this vision, MAMA is seeking funds for the educational, organizational, and technological coordination and collaboration required to create the AV-Space ecosystem in Michigan. This ecosystem will ensure Detroit remains the global center of automotive engineering and manufacturing for the benefit of future generations.

MAMA will identify and attract national technology stakeholders (automakers to space technology manufacturers) who in collaboration with the Michigan Launch Initiative, the Smithers Winter Test Center, Chippewa County EDC, the American Center for Mobility, Planet M, and the Michigan Office of Future Mobility and Electrification will comprise the SECAM RIN. Together, we will build a consortium that can design, implement, and operate technologies that mature vehicle automation from conditional automation (L3) to full automation (L5) by enabling extended vehicle-to-vehicle (V2V) and vehicle-to-infrastructure (V2I) through the development of infrastructure, software, and hardware solutions inclusive of solutions powered by LTE, 5G, and satellite connectivity.

The SECAM RIN will coordinate the research and development of the engineering design guidelines and standards for a common automotive industry platform of ACAM data links and develop a pathway towards implementation ACAM enabling technologies. This approach positions Michigan as the center of these efforts while creating jobs and advancing the Nation's technological competitiveness.



Setting the Stage: Our Vision

Why We Are Doing This: Our Imperative for Creating the SECAM RIN

Mobile network operators are projected to invest more between \$1 and \$3 trillion, via capital expenditure, into modernization and expansion efforts related to 5G¹. By some estimates, deploying 5G will cost at least \$130 billion over the next five years just to build out the required national fiber backbone². With investment requirements such as this, we recognize that the dream of dense nationwide 5G coverage in urban and rural areas is not here today. Furthermore, the deployment of 5G will naturally gravitate towards urban areas first, which means that rural areas, underserved communities, and large swaths of the Federal Interstate System will not receive the promise of 5G's high-speed, low-latency capabilities for some time to come.

Even before the COVID-19 pandemic, the digital divide was already significant. High-speed fiber passes less than one third of U.S. homes and less than 40% of consumers have access to more than one broadband provider of 25 Mbps³ — the minimum speed definition of broadband according to the Federal Communications Commission. The COVID-19 pandemic and the massive workforce shift to remote workspace further strained limited broadband capabilities and widened the digital divide. With a significant lack of ubiquitous, high-speed communications capabilities across the U.S., it seems challenging to provide the high-speed, low-latency communications capabilities that are required to mature autonomous mobility systems from just over Level 3, where we are today, to Level 5, wherein there is full autonomy and we can realize the economic promise of the new mobility system. However, despite the financial challenges of rolling out 5G, the value proposition remains strong. By 2023, 5G-enabled manufacturing plants could add between \$1.5 trillion to \$2.2 trillion annually to the global economy⁴. Within the U.S., the deployment of 5G could contribute \$1.5 trillion to the US GDP and create 4.5 million jobs⁵.

We believe we can accelerate that vision for the future, help to close the digital divide, incentivize transformation in the U.S. automotive industrial base, and create sustainable, head-of-household jobs. We believe this because of our long history in the State of Michigan as witnesses to the industrial might of the Big 3: Ford, General Motors, and Chrysler. In the moments before the industrialization of the automobile, the commercialization of the Internet, and the incentivization of renewable energy, only a few visionaries realized that we were on the precipice of generational transformation. Today, most

leading technologists and strategists recognize the promises of advanced connectivity and advanced mobility. We recognize the power in delivering advanced connectivity for advanced mobility even, but with a multi-trillion-dollar investment required to unlock the promise, the path forward can seem daunting. Yet, even in uncertainty observed before, targeted and tangible innovation efforts occurred. The invention of the moving production line, the creation of the TCP/IP network protocol, the formation of Amazon as a bookstore – these were all targeted efforts to start somewhere that ultimately became the backbone of industries and U.S. GDP growth.

With advanced connectivity for advanced mobility, we see the ability to direct targeted investment and incentivization towards SECAM capabilities and technologies that is complimentary to and expands the investment and innovation currently underway in U.S. telecommunications, technology, and automotive firms.

What We are Trying to Do

MAMA is trying to incentivize the development of a mesh network capability for the nation by focusing on the development of the middleware for SECAM. We do not wish to deploy 5G cellular towers, launch rockets, build satellites, manufacture automobiles, or lay fiber optic cable ourselves. Instead, we want to make it easier for those commercial companies to expand, integrate, and commercialize their solutions in ways that create economic value and technological capabilities for the nation. In many ways, our vision for the SECAM RIN is similar to the vision for Bell Labs and Xerox PARC in their prime. We wish to invent, incubate, and commercialize the technologies that we recognize need to be present for ACAM to truly work.

Through this lens, we recognize large capability and technology gaps present in the middleware technologies and systems required to implement our vision of a mesh network for advanced mobility. We estimate that the development and deployment of a SECAM-centric advanced network solution is likely to cost between \$3 billion and \$6 billion, a small cost compared to the trillions required to deploy nationwide 5G in total, but an unattractive price tag for traditional small scale funding programs.

Our Plan

MAMA and its partners have put in significant effort since early 2020 to develop the necessary foundational and enabling

components for the establishment and enablement of the SECAM RIN. As part of our planning efforts, we have determined the key components that are required for success:

- \$100-\$150M in initial seed investment to establish and operationalize the RIN. This initial investment would ultimately be spent over the 3 to 5 years and could be annualized if coming from the U.S. Government or other appropriated source.
- A playbook to guide us through the strategic choices required to establish and operationalize the RIN (summarized in this document)
- A plan to guide us as to what technology development areas we should focus on, what industrial base components we should seek to develop, and what continuous non-project management functions are required to ensure we achieve success (summarized in this document)
- An understanding of our shovel-ready, remote-capable initial activities that we would initiate after receiving funding

Additionally, our partners have contributed substantial expertise to help us understand key considerations for establishing and scaling the RIN such as:

- The pathways for developing the RIN operating model
- The development of governance to expedite planning, support stakeholders, and prioritize operational and back-office requirements
- The creation of additional legal entities as required to receive public and private investment, to hold or license intellectual property, or conform to legal and regulatory requirements
- The creation of SECAM technology related investment vehicles from LLC and joint ventures, to government-backed business development companies regulated under the US Investment Company Act of 1940 that focus investments on small-to-medium AC, AM, space, or other enabling technologies
- The requirements for performing continuous supply chain illumination to identify fragility, challenges, and risks, inclusive of weaponized M&A by peer and near-peer adversaries, in the US-based supply chains for targeted SECAM related technologies and capabilities
- The foundational requirements for cyber security, resiliency, and defense for SECAM related technologies, services, and infrastructure

Our ambitions, vision for tomorrow, and plan have been directly influenced through direct engagement with the previous and current Administration, the Department of Defense, the Department of Commerce, the National Aeronautics and Space Administration, commercial space companies, US automotive manufacturers, Fortune 500 companies, early stage startups, venture capitalists, technologists, engineers, and STEM educators.

Funding Requirements

Our goal is to fund this through initial U.S. Government investment to establish and operationalize the SECAM RIN. Once we have operationalized the RIN, we will plan to raise private investment into the consortium or targeted network firms as appropriate and legally allowed. Additionally, we may seek other U.S. Government funding in the form of grants or prototype awards as appropriate and applicable.

Our U.S. Government funding request

MAMA is requesting \$100M in U.S. Government funding for the establishment and operationalization of the SECAM RIN and its associated Michigan Center of Excellence.

Our request is based on two U.S. Department of Defense technology development initiatives that provide precedent for our funding request, structure, and timeframe.

Precedent 1: Our request is benchmarked to the Department of Defense funded University Consortium for Applied Hypersonics (UCAH), formed in 2020, that is funded at \$100M over five years and is a hybrid version of the traditional University Affiliated Research Center (UARC) and the Army's Multi-Disciplinary University Research Initiatives.

Precedent 2: Within the framework of traditional Department of Defense research consortia frameworks, our vision for the SECAM most closely resembles a Collaborative Technology Alliance that can include industry, academia, and government. The U.S. Army's Robotics Collaborative Technology Alliance (RCTA) was funded at \$63.2M over five years starting in 2010 with the option to renew at \$65M for an additional five years.

To be clear, we view U.S. Government funding a way to kick start our RDT&E, innovation, and commercialization efforts while we seek to attract private investment. Initial U.S. Government funding not only de-risks our project but it also helps to attract additional public and private investment. This is the same approach that NASA used when creating the Commercial Crew program that

resulted in awards for the development of human spaceflight transportation capabilities from American soil that not only supported NASA's needs in low Earth orbit, but also helped attract additional private investment and open the market for private orbital human spaceflight.

Benefits to Michigan and the Nation

Our SECAM RIN efforts will originate in Michigan but also have the potential to be executed in other states as applicable and advantageous. The technology we wish to incentivize is designed to be built and operated in America for the benefits U.S. industries, corporations, and citizens.

National Security Impacts

Beyond supporting the transformation of the U.S. automotive industrial base and the advancement of connectivity capabilities across the nation, we recognize that our efforts can support and advanced U.S. space superiority. Our efforts have the potential to support and grow the aerospace and defense industrial bases to scale resilience and provide additional on-orbit capabilities and ground systems architecture for commercial satellite communications capabilities. Commercial satellite communications capabilities continue to be a cornerstone commercial service for U.S. Intelligence Community and the U.S. Space Force.

Additionally, space and information are the new high grounds. The next conflicts will be won through space and battlespace superiority enabled by unfettered access to the new high grounds and the deployment of connected warfighters. SECAM technologies have the ability to advance capabilities across the Department of Defense by advancing capabilities for U.S. Army ground vehicles, TRANSCOM operations, U.S. Air Force Air Mobility Command aircraft, and U.S. Air Force Air Combat Command assets to name a few.

The development and deployment SECAM technologies can enable resilience in the supply of connectivity solutions to the Department of Defense. To be clear, we remain optimistic about SpaceX and its Starlink constellation, but we also realize the value of ubiquitous connectivity and we recognize that multiple capability solutions are a force multiplier for national and homeland security.

Lastly, ensuring the U.S. has more of a first-mover advantage allows the U.S. Government and U.S. corporations to capture and control the network space, drive the interoperability standards, and secure physical operational slots on orbit. Similar to how China and other adversaries have attempted to control the rare earth metals and energy sectors, investing in U.S. industries allows the U.S., its corporations, and its interests to shape and control the downstream supply for satellite services and connectivity. If

success is shown in the U.S., other companies may pilot or test their equipment here, giving the U.S. further control of who or how global competition develops.

Economic Impacts

Establishing and operationalizing the SECAM RIN is an investment in innovation and digital transformation for a key U.S. sector – the automotive industry – and impacts the U.S. telecommunications, aerospace and defense, and technology sectors as well as those cross-sector entities supporting autonomous vehicles and electrification.

Investing in this project creates American jobs, supports industrial competitiveness, and encourages capital market growth. In this current economic environment, technology-centric companies have flourished while traditional manufacturing has floundered. Technology leaders have seen two years of digital transformation occur in a single quarter leaving companies and consumers to expect more technology driven solutions going forward.

Capital market growth benefits every American. Investments into these innovation priorities for publicly traded companies increases their competitiveness and thereby the attractiveness of their associated exchange-traded funds to investors. Despite a global economic downturn, innovation and technology-focused companies continue to thrive with positive stock market performance in U.S. Government FY21 and since March 2020.⁶

For example, Tesla, when viewed as a technology company that happens to be making cars, has outpaced much of the U.S. technology sector in growth over the past 10 months. Government stimulation of technologies that are impactful and transformation for the Big 3 not only creates jobs, but also creates realizable economic value to those that invest in them. Spurring growth in the automotive market can lead to value creation in the U.S. public capital markets.

Economic Mobility and Job Creation

We are set to have an impact on Day 1 of our effort with remote-ready work that will be conducted across the nation, by Americans, in support of this effort. We have a remote-ready to shovel-ready approach that is premise-managed to ensure that we can begin work immediately regardless of the COVID-19 environment. Ultimately, at the realization of our end-state vision, we could be looking at creating and supporting over 25,000 high technology and manufacturing head of household jobs if we do this right from the start.

Automotive Industry Impacts

On the horizon, we recognize that a new mobility ecosystem is emerging based on shared, autonomous mobility. This new mobility ecosystem is enabled through data-driven, smart technologies that will be deployed across the mobility ecosystem. This new ecosystem will be implemented through new vehicle development programs and the deployment of advanced mobility platforms, all of which will rely on advanced communications.

ACAM is not a new concept, but it remains early stage due to the disparate nature of high-speed connectivity available in urban and rural areas. However, the proliferation of high-speed connectivity from air and space infrastructure across the United States has the power to transform American cities. As such, our SECAM RIN seeks to incentivize the creation of the underlying infrastructure across the air, space, and ground domains. Beyond the benefits to Michigan and the Nation, we have identified four key value propositions that SECAM technologies create for automotive manufacturers:

1. Opportunities to engage consumers in transit
2. The enablement of new pathways towards value creation
3. Accelerated advanced autonomous mobility capabilities in urban and rural areas
4. Advanced aerial mobility capabilities and integration into the overall mobility ecosystem

Opportunities to engage consumers in transit and the enablement of new pathways towards value creation represent significant market opportunities for automotive manufacturers as they transform the way in which automotive OEM's approach vehicle development and operations; customer in-vehicle, ownership, and utilization experience engagement; consumer relationship and engagement; and overall mobility management.

Establishing and operationalizing the SECAM RIN through our proposed public-private partnership consortium framework provides automotive manufacturers the ability to benefit from shared national investment, targeted innovation and technology development, and shared infrastructure deployment. The SECAM RIN efforts seek to create plug-and-play, open and accessible infrastructure that can be used by multiple vendors, users, or consumers thereby creating a standardized and commoditized capability that is beneficial to the industry and not a single manufacturer.

The Potential for Scaling the SECAM RIN to a Nationwide Effort

In 2020, we worked closely with our partners to develop a pathway towards deploying the SECAM RIN at a national level. Under this plan, we identified opportunities to conduct technology development, field testing and evaluation, integration, and commercialization activities across five key states (California, Arizona, Texas, Michigan, and Florida) along with associated efforts in adjacent innovation and industrial clusters located around Colorado Springs, CO; Huntsville, AL; Dayton, OH; Charlotte, NC; New York City, NY; and Mechanicsburg, PA – mostly areas that would benefit from increased economic mobility and industrial base growth.

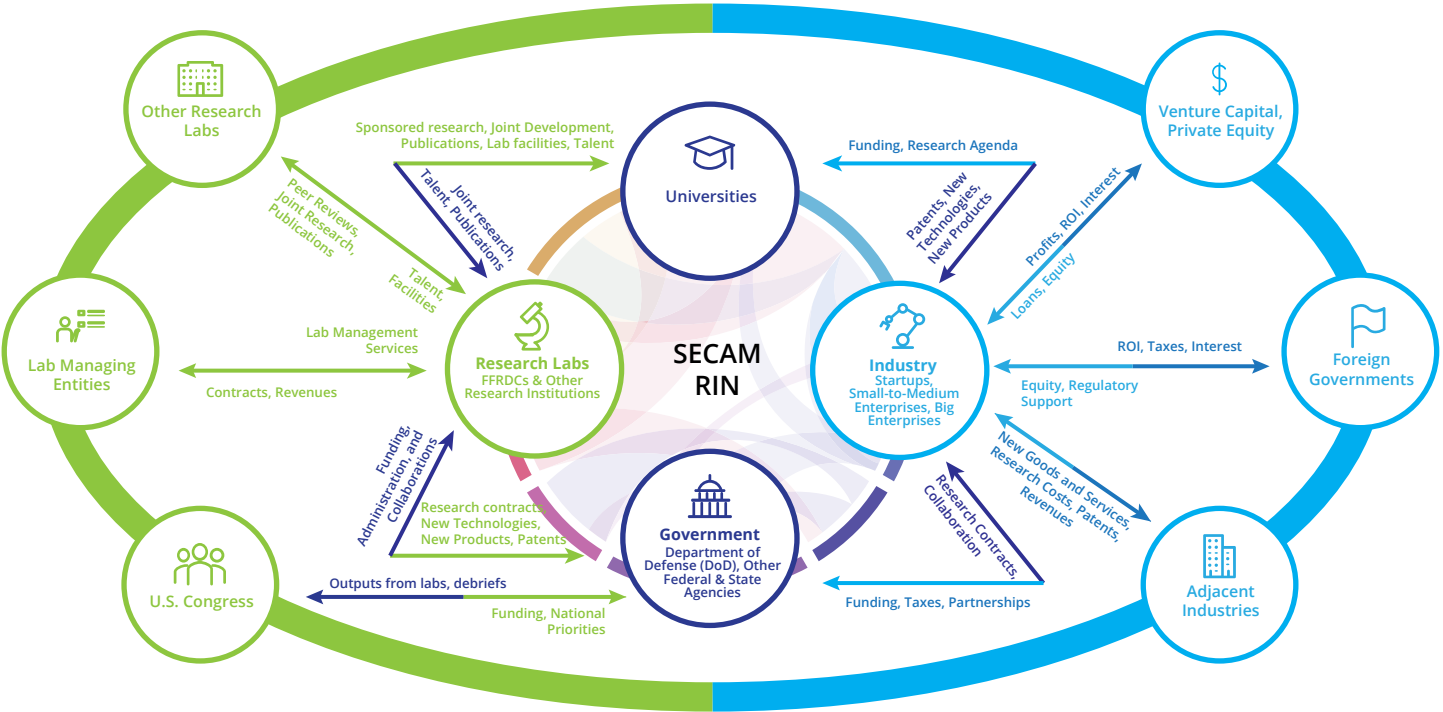
This National Project Plan (NPP) was aligned to commercial and academic capabilities and facilities but was designed to interface with US Government programs and facilities across the nation such as those that support assured access to space, space systems operations, ground system vehicle development, and other commercialization, defense, and national security imperatives overseen by the Department of Defense, Department of Energy, and the National Aeronautics and Space Administration. The NPP aligns to national, regional, and local economic priorities outlined by various U.S. Government (USG) Agencies including the Food and Drug Administration (FDA), Federal Communications Commission (FCC), National Aeronautics and Space Administration (NASA), Department of Defense (DoD), Department of Commerce (DoC), the White House, and the National Space Council.

Ultimately, the NPP is designed to create generational transformation of key components of the Nation's industrial and technological bases, specifically those bases and associated clusters and MSAs that support activities in the telecommunications, aerospace and defense, transportation and logistics, and automotive industries, by conducting SECAM RIN efforts at the national level.

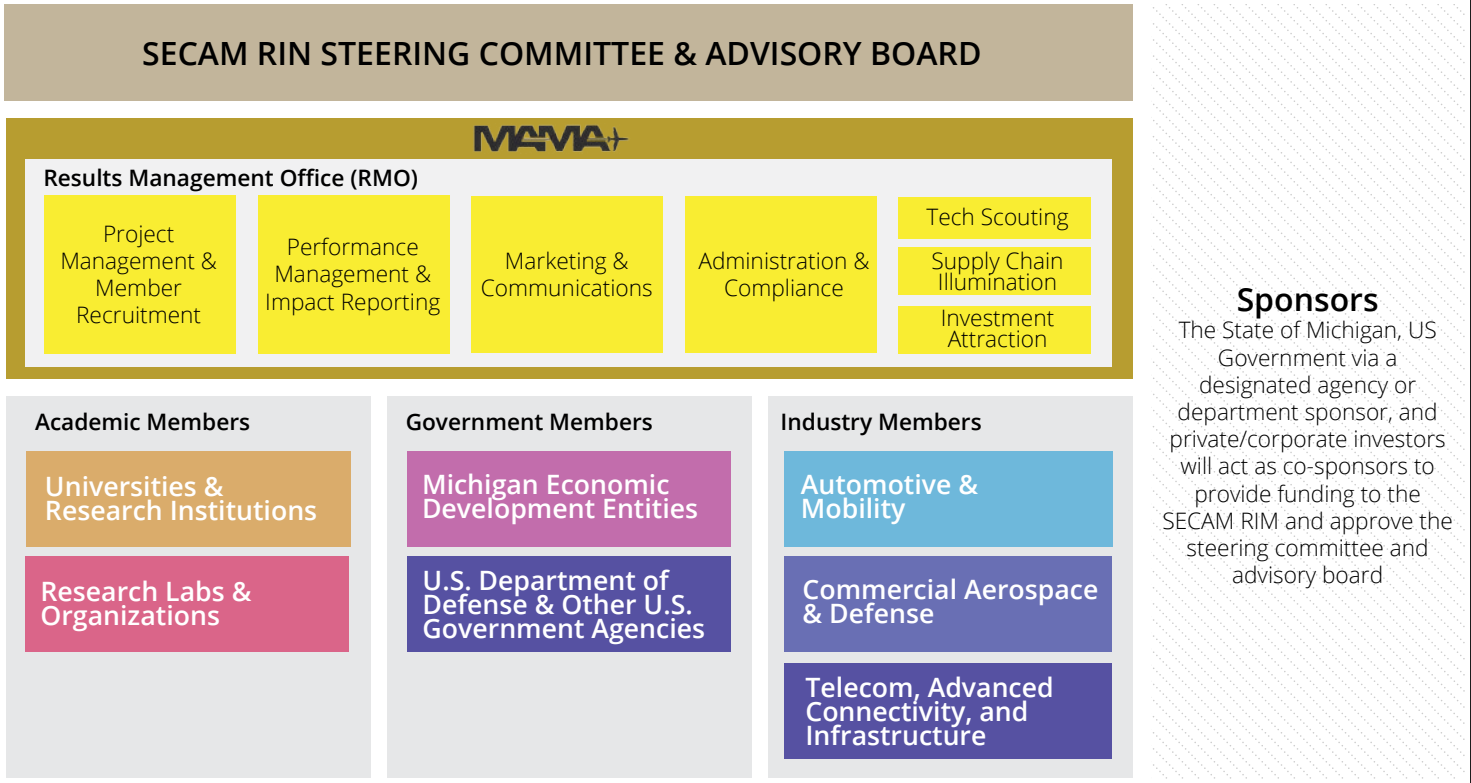
Operationalizing the NPP requires the initial CDP for the SECAM RIN to be completed along with an NPP CDP, which would require additional funds to support the scale in scope. Currently, the NPP is not in this scope but it would be possible to develop the NPP concurrently with the in-scope SECAM RIN CDP for the Michigan COE.

The SECAM RIN in the Context of the U.S. Innovation Ecosystem

Within the U.S., Innovation Ecosystem, we are proposing to place the SECAM RIN where the technology development priorities of universities and research labs, industry, and government for ACAM technologies intersect. To do this, we have developed a consortium framework to align the SECAM RIN sponsors, efforts, and members.



SECAM RIN Consortium Framework





Our Plan is Shovel-Ready, Today

Thanks in part to our efforts since 2020, we are shovel-ready today and can begin deploying capital into the SECAM RIN activities within approximately 90 days, subject to any legal or regulatory requirements and compliance. We have identified four initial tasks that are ready today and can be conducted in co-located, hybrid, or remote fashions to ensure that we are not hindered by the current COVID-19 environment.

We see the initial four tasks as foundational to our success and will ensure that our technology development and maturation efforts can begin as soon as possible.

1. Establish the Results Management Office
2. Begin the recruitment of SECAM RIN members
3. Produce the Comprehensive Development Plan
4. Develop the OV-1 End-State Architecture Initial Draft

Results Management Office

Traditional projects are often driven by a project management office (PMO) that is responsible for the successful execution of the project. However, given the scope and scale of the SECAM RIN along with the need to conduct continuous functions that require deep subject matter expertise, we will employ a Results Management Office (RMO) that is responsible for formulation of the comprehensive development plan (CDP) and the execution of the technology scouting and horizon scanning, secure supply chain illumination, and investment attraction. Additionally, the RMO will be responsible for marketing, communications, compliance, and performance management.

To ensure that we are ready for Phase 1, working with our partners, we have already established our processes and procedures for conducting key technology development, economic development, workforce development, and other incentivization efforts. These processes and procedures would be conducted by our RMO and are centered around:

1. Technology Scouting and Horizon Scanning
2. Technology Feasibility Assessment
3. Supply Chain Illumination
4. Systems Architecture Design and Development
5. Architecture-Based Concept of Operations Development
6. Cyber Security and Resiliency Design Guidelines
7. Economic Impact Analysis and Strategy Formulation

Comprehensive Development Plan

In 2020, we developed our process for creating a comprehensive development plan (CDP) that begins with a feasibility to assess the current state of the identified technology domains and industrial base components. The CDP focuses on the intersection of space, next-generation communications such as 5G, and autonomous vehicles and centers around the initial operationalization of the SECAM RIN as a Michigan-based Center of Excellence (COE) that directly supports the SECAM development aspirations and allows the Great Lakes states to engage and benefit from a growing space economy inclusive of the industrialization and commercialization of Low Earth Orbit (LEO). The Michigan COE brings together academia, commercial companies, and defense organizations interested in building and leveraging the capabilities of a Mid-America space technology ecosystem.

The CDP itself provides the foundational elements of the RIN program inclusive of the OV-1 architecture and development roadmap, locational strategy, and capital and infrastructure investment plan. These elements advance the RIN and provide the U.S. Government, the State of Michigan, and members of academic, industry, and other government organizations with a development plan that is supportable, executable, and fundable. When completed, the CDP will enable the Mid-America states to leverage the momentum of a rapidly growing American space industrial base to generate economic activity and job creation in the automotive, technology, and aerospace sectors within the Mid-America region. The CDP also aims to qualify and quantify the economic impact of the SECAM RIN and Michigan COE activities as part of the initial assessment as well as to provide guidance for ongoing impact analysis in support of the RMO's performance management activities.

Recruitment of SECAM RIN Members

Since early 2020, MAMA has engaged with industry, academic, and government entities to assess participation in the SECAM RIN. Originally formulated as the AV-Space working group, collectively, we envision these entities as critical members of the SECAM RIN wherein some members will execute the technology development work directly while others will guide and accelerate our efforts to realize the SECAM RIN end-state vision. MAMA has identified over 30 potential entities for recruitment into the SECAM RIN upon establishment.

OV-1 End-State Architecture Development

Operational View 1 (OV-1) End-State Architecture Development
As part of the comprehensive development plan, the RMO will be responsive for the OV-1 End-State architecture development that will culminate the architecture visioning workshop and subsequent reporting.

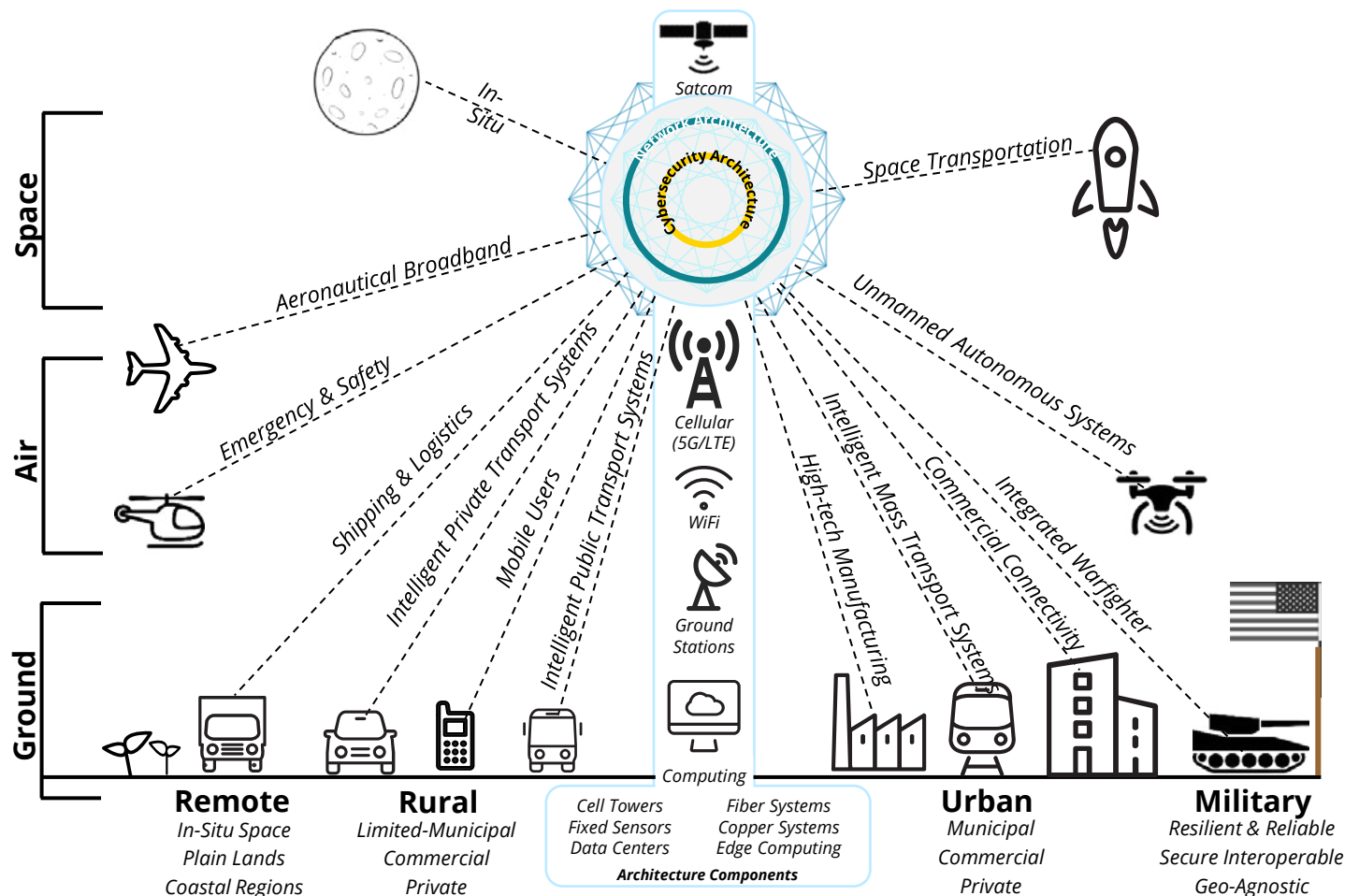
We will use the OV-1 End-State development to:

- Develop a shared future vision of a secure and extensible mesh network including infrastructure, software, and hardware powered by LTE, 5G, and satellite connectivity
- Outline architecture requirements that enables iterative design, test and implementation of ubiquitous secure communications capabilities through the deployment of advanced connectivity standards and standard on-vehicle technologies.
- Develop a connectivity strategy framed around technology and industry imperatives to define an integrated business case
- Develop the blueprint for network and application design

formulated around the traditional Department of Defense OV-1 architecture frameworks.

To do this, we will perform the initial rounds of technology scouting and horizon scanning to identify the current, emerging, and transformational technologies that can be matured, accelerated, utilized, or combined in support of the SECAM architecture and end-state aspirations. The OV-1 End-State architecture is meant to be continually evolving and, as such, initial efforts will be focused on the initial draft.

A Pre-OV-1 Conceptual View of the SECAM Vertical Technology Stack



The Playbook for Establishing the SECAM Research and Innovation Network

1

Start with the end in mind

2

Determine the targeted time horizon for technology development

3

Determine the business case

4

Determine the value proposition

MAMA's vision for the end-state is an integrated mesh network that can link multiple vendors, technologies, and capabilities to provide ubiquitous connectivity across the nation in urban and rural areas.

MAMA will conduct RDT&E, innovation, and acceleration activities for Third Wave Transformative (5-year time horizon) advance connectivity solutions that benefit advanced mobility concepts of operations in support of economic development and national security needs.

Countries that were first to adopt prior generations of wireless technology, such as the United States in 4G/LTE, were also rewarded with broader macroeconomic benefits. But 5G offers the potential for an even larger advantage to countries that adopt 5G first. Advanced connectivity is foundational to innovation and transformation in the United States and advanced networking, or the ability to link advanced connectivity to commercial and defense use cases, is the means to deliver economic value. Advanced mobility and frictionless, automated, and personalized travel can only be enabled when advanced connectivity can reach the vehicles and users themselves. Without concerted and coordinated neutral acceleration efforts around advanced networking and enabling capabilities, advanced connectivity and advanced mobility will continue to develop and mature at different rates thereby leaving economic value on the table.

MAMA will create a research and innovation network (RIN) for space enabled advanced connectivity for advanced mobility (SECAM) that can act as a neutral conveyor of industry, academic, and government institutions to advance technology readiness levels and commercialization potential for advanced connectivity, advanced mobility, and associated technology and infrastructure solutions in ways that would otherwise not occur without intervention and collaboration.

MAMA will develop and foster an ecosystem through the SECAM RIN comprised of providers of telecommunications and advanced connectivity solutions, cloud and computing infrastructure, advanced mobility capabilities inclusive of autonomous ground vehicles and advanced aerial mobility vehicles, commercial aerospace and defense providers inclusive of launch and satellite companies, systems integrators, academic research institutions, state and local economic development entities, and the U.S. Department of Defense and other applicable U.S. Government entities.

MAMA will designate itself as the neutral third-party entity during the standup of the SECAM RIN with the option to create a successor non-profit, third-party entity as the SECAM scales. We believe we are best suited to lead the RIN as we can move at the speed of business and are not limited by the basic or applied research constructs that often limit university-led research consortia.

MAMA will establish the SECAM RIN as a hybrid consortium model, similar to the University Consortium for Applied Hypersonics (UCAH) that was funded via the Department of Defense in 2020 with the goal of incentivizing collaboration between the DoD, NASA, the U.S. Department of Energy, a network of universities, and state and regional development organizations.

MAMA requests \$100M from the U.S. Department of Defense to establish the SECAM RIN with a 5-year initial charter for RDT&E and innovation activities. This amount would represent the U.S. Government contribution to the RIN with an understanding that additional federal, state, private, commercial, and university funding would be sought to match the DoD contribution.

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- 5 Determine the ecosystem positioning**
 - 6 Designate a neutral, third-party entity to lead the RIN**
 - 7 Determine the appropriate US Government (USG) research constructs to leverage USG funding and investment in support of RDT&E and commercialization goals**
 - 8 Determine the appropriate level of USG incentivization funding required to establish and operational the RIN**

The MAMA Plan for Establishing the SECAM RIN and Accelerating Technology Development

Since early 2020, MAMA has been working to assess the current state of advanced connectivity and advanced mobility technologies across the Nation with a goal of incentivizing the development of a communications mesh network capability to advanced autonomous mobility, rural connectivity, and economic prosperity. Our plan is to build an RDT&E and innovation capability for the identified technology development areas in support of our industrial base development aspirations. We see this as complementary to public and private investment in 5G, satellite communications, and automotive electrification. Our vision to fill technology and capabilities gaps that benefits these efforts in a way that is market-driven, not monopolistic or government-owned, government-operated. Through extensive analysis and market research, we have determined that it will take approximately \$100M to establish the SECAM RIN and operationalize it at a level that is sustainable while additional private investment is sought.

Funding Ask

US Government
Seed Funding to
Establish the RIN

\$100M

Based on the University Consortium
for Applied Hypersonics funding
model

SECAM RIN Technology Development Areas

Autonomy & Autonomous Systems

Advanced autonomous systems technologies for use in ground and aerial vehicles as well as automation technologies for operational environments

Cyber Security, Resiliency, and Defense

New technologies will require new methods for active cyber defense and resiliency in the face of an increasing cyber threat landscape

Artificial Intelligence and Machine Learning

Contextualized and symbolic artificial intelligence, advanced machine learning, human intelligence interfaces, and ambient experience technologies

Advanced Networking Infrastructure

Advanced networking infrastructure inclusive of vehicle connectivity (V2V, V2I), ground systems, satellite communications, and other enabling network software and hardware

Edge and Quantum Computing

Computing capabilities at the edge including distributed and disaggregated computing today and advanced computing technologies such as quantum tomorrow

Establishing and Operationalizing the RIN: We are Shovel Ready Today

We understand our pathway to operationalization

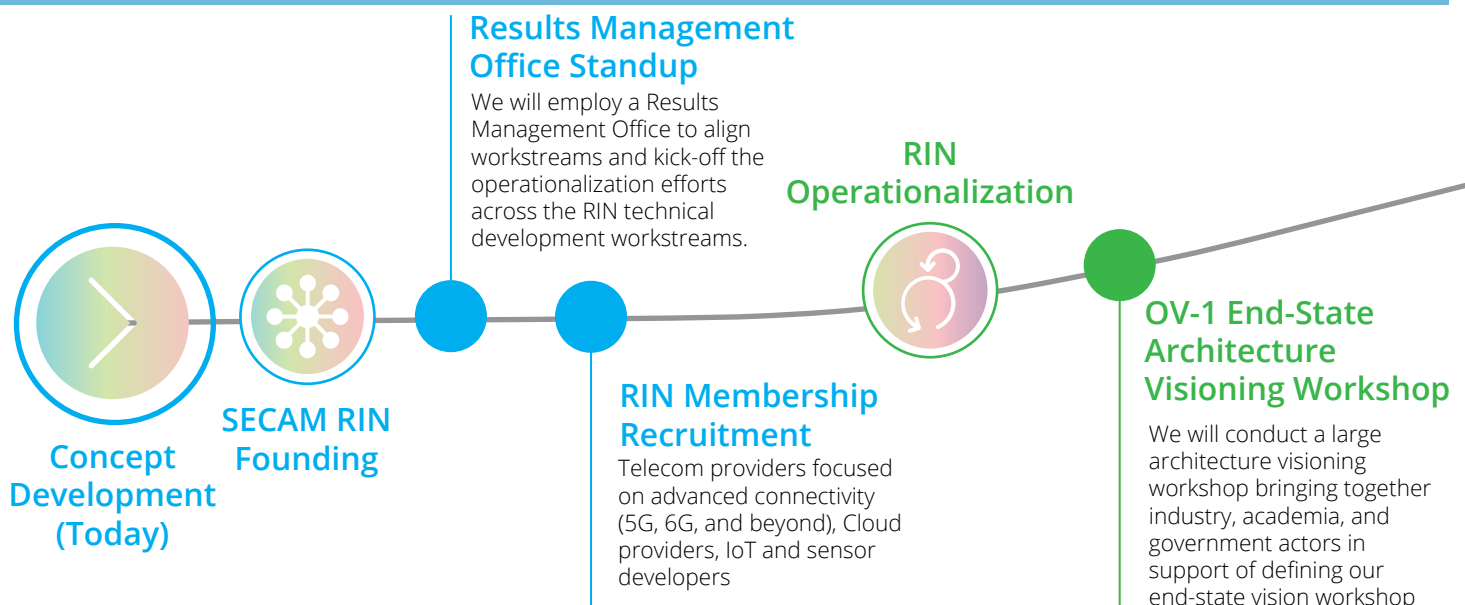
MAMA has worked closely with industry leaders over the past year to define the requirements to operationalize the RIN from the standup of a results management office through stakeholder engagement and membership recruitment. We believe we can be operational with 90 days of funding receipt

We have forged partnerships across the proposed membership structure

From leading academic institutions to scalable startups and technology-focused large corporations, we have identified the first round of potential RIN members and stakeholders

Our identified partners can conduct classified work today

We have the ability to address government needs at the TS//SCI level on Day 1 ensuring that national security priorities can be incorporated at the start (as appropriate)



SECAM RIN Industrial Base Development Areas

Advanced Manufacturing

The domestic development of additional 3D and 4D printing, advanced composites development, smart factories, and smart supply chain

Automotive Manufacturing

Commercial organizations focused on the future of mobility, aerial mobility, unmanned aerial systems, electrification, and automobile manufacturing

Commercial Aerospace & Defense

Commercial organizations focused on space launch satellite manufacturing, space systems operations, advanced aerial mobility, and commercial aviation

Telecommunications & Technology

Telecom providers focused on advanced connectivity (5G, 6G, and beyond), Cloud providers, IoT and sensor developers

SEACAM RIN Continuous Functions

Technology Scouting & Horizon Scanning

Technology scouting and horizon scanning will be used to identify third wave technology, market risks, and capability gaps that will inform our innovation sprints

Secure Supply Chain

Supply chain illumination will be utilized to maintain control of logistical arm of the supply chain to isolate critical technology suppliers, assess national security risk from weaponized M&A, and mitigate supply chain fragility risks

Investment Attraction

Opportunities to secure additional public and private investment will be considered across the life of the RIN

An Agile Approach to Technology Development and Innovation

A repeatable *innovate*, *scale*, and *commercialize* process allows the SECAM RIN to decompose the technology development areas into addressable actions with achievable goals in order to accelerate speed to market and/or user adoption.



Pilot testing and evaluation (T&E)

Following pilot development, we will conduct real-world testing and evaluation of pilot technologies and capabilities

Scale Phase

Commercialization Phase

Market Entry & User Adoption

Innovation Sprint

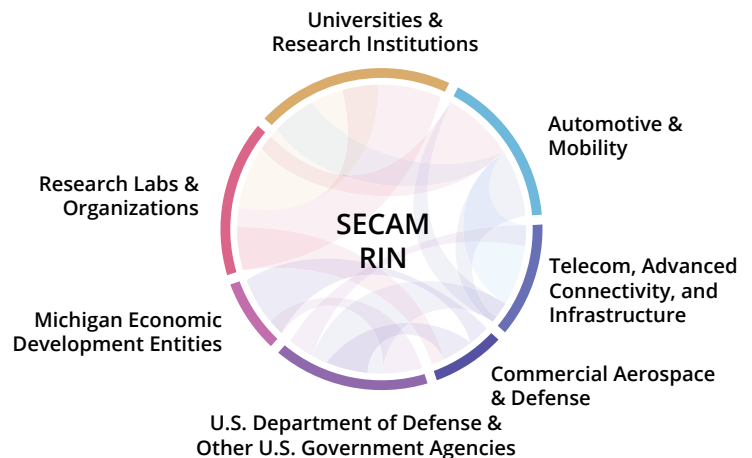
Sprint pilot development (D)

Based on the research, we will conduct early development and experimentation to assess technology concepts and capabilities

Sprint program research (R)

Based on the OV-1 concept, we will conduct basic experimentation and testing to determine pilot applicability and readiness

SECAM RIN Consortium Membership Structure





Endnotes

- 1 Deloitte research provided to MAMA in September 2021
- 2 Deloitte research provided to MAMA in September 2021
- 3 Deloitte research provided to MAMA in September 2021
- 4 Tim Hornyak, "5G is accelerating factory automation that could add trillions to the global economy," CNBC, July 20, 2020. <https://www.cnbc.com/2020/07/11/5g-spurs-factory-automation-could-add-trillions-to-economy.html>
- 5 <https://www.ctia.org/news/report-5g-promises-massive-job-and-gdp-growth-in-the-u-s>
- 6 Deloitte research provided to MAMA in September 2020.



About the Michigan Aerospace Manufacturers Association (MAMA)

MAMA's purpose is to promote the aerospace manufacturing industry in the State of Michigan and, in connection therewith, to help shape a favorable legislative and regulatory environment, encourage innovation and productivity, facilitate employment growth, and increase public understanding of the industry and its economic contribution to the State of Michigan.

MAMA's commitment to continuous opportunity development is evidenced by the Michigan Launch Initiative (MLI). MAMA's MLI program is developing a spaceport facility for the launch of rockets carrying small & mid-sized satellites into Low Earth Orbit (LEO) from horizontal and vertical platforms and a Command Center to manage post-launch satellite operations.

The spaceport will have an adjacent technology park to attract firms entering and active in the commercialization of near earth outer-space.

MAMA continues to generate interest in Michigan's small and midsize manufacturing enterprises from aerospace and defense top-tier and prime contractors through trade-missions and industry days.

MAMA is committed to the growth and prosperity of Michigan

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