2025 MAINE SPACE INDUSTRY

Workforce Development Roadmap

MAINE SPACE CORPORATION

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LETTER FROM THE CHAIR OF THE BOARD OF DIRECTORS

Dear Colleagues, Partners, and Friends,

On behalf of the Board of Directors of the Maine Space Corporation, it is my distinct honor and pleasure to present the Maine Space Industry Workforce Development Roadmap.

This document marks a historic milestone for Maine. It charts a bold and strategic course to position our state at the forefront of one of the most dynamic and transformative sectors of the global economy—the New Space economy. With the global space market projected to exceed $1 trillion in value within the next decade, Maine is uniquely poised to capture a share of this growth by harnessing the ingenuity, resilience, and entrepreneurial spirit that define our people.

The Roadmap thoughtfully identifies the critical skills, educational pathways, and industry partnerships that must be cultivated to support a thriving space economy in Maine. It recognizes that to lead in this new frontier, we must invest in our students, our educators, our workers, and our innovators. It calls for building an inclusive, future-ready workforce that is prepared not only to meet today's demands but to pioneer tomorrow's opportunities across launch services, satellite manufacturing, advanced manufacturing, software development, and space data analytics.

This vision is bold, but it is within reach. It is a call to action for all of us—educational institutions, industry leaders, government agencies, and communities—to collaborate, innovate, and invest in Maine's future. By implementing this Roadmap, we will not only drive economic growth and job creation, but we will also inspire new generations of Mainers to see their future among the stars.

On behalf of the Board, I extend my deepest gratitude to all those who contributed their expertise, energy, and ideas to the development of this Roadmap. **A special thank you to Emily Dwinnells and Jeremy Ashlock.** Your work has laid the foundation for a transformative era in Maine's history.

The Maine Space Corporation stands ready to champion this effort with determination and pride. Together, we will propel Maine to new heights and ensure that our state becomes a recognized leader in the global space economy.

The future of space is here—and it begins in Maine.

Sincerely,

Dawn DiBlasi, Esq.
Chair, Board of Directors
Maine Space Corporation

EXECUTIVE SUMMARY

The Maine Space Industry Workforce Development Roadmap presents a bold vision to position Maine as a national and global leader in the rapidly evolving New Space economy. To realize this vision, the Roadmap outlines a set of strategic goals that integrate education, workforce development, entrepreneurship, and economic planning. These goals aim to build a skilled, resilient, and future-ready workforce; attract and retain talent and investment; and leverage Maine's geographic, institutional, and industrial assets to compete in the emerging "space-for-space" economy.

While Maine holds distinct advantages—such as coastal launch capabilities, advanced manufacturing expertise, and strong academic institutions—critical gaps in awareness, training, and workforce readiness must be addressed. The Roadmap provides a coordinated framework to close these gaps and align the state's efforts across sectors. The following visual roadmap presents the strategic goals that form the foundation for sustained, collaborative action among Maine's public, private, and academic stakeholders.

STRATEGIC GOALS

1. *Position Maine as a national leader in the New Space economy by developing a highly skilled, space-ready workforce across the full space value chain, including advanced manufacturing, precision fabrication, environmental testing, and launch support operations.*

2. *Cultivate a robust education and training ecosystem with accessible, stackable pathways for K–12 students, postsecondary learners, incumbent workers, and trades-based professionals seeking aerospace-aligned credentials.*

3. *Raise statewide awareness and engagement through outreach, partnerships, and experiential learning that connect students, educators, and businesses to space careers.*

4. *Develop a sustainable, innovation-driven Maine Space Complex with facilities for R&D, manufacturing, analytics, and launch operations.*

5. *Bridge current and future skills gaps by introducing space-aligned curricula, micro-credentials, and hands-on training in aerospace welding, composites, electronics, clean room protocols, and robotic manufacturing.*

6. *Retain and attract talent through career pathways, mentorship, and entrepreneurial support for in-state graduates and new professionals.*

7. *Drive economic growth by enabling the Maine space economy to generate $550M–$1.1B in GDP annually and create 2,800–5,500 high-wage jobs by 2042.*

8. *Ensure global competitiveness by promoting Maine's space capabilities and positioning the state as a key player in the international space economy.*

9. *Strengthen Maine's trades and industrial base by integrating aerospace-grade technical training—including welding, machining, composites, environmental testing, and clean room protocols—into CTE, community college, and incumbent worker programs. This dual-benefit strategy will support both the space economy and legacy sectors such as shipbuilding, marine manufacturing, and precision fabrication.*

CORE THEMES

The strategic goals are organized around two core themes that guide implementation:

THEME 1:

Raising Awareness, Engagement and Fostering Collaboration -

This theme lays the groundwork for a strong talent pipeline by engaging students, educators, businesses, and communities. Goals focused on outreach, partnerships, and public engagement (e.g., Goals 1 and 3) rely on coordinated efforts to build awareness, strengthen networks, and elevate Maine's visibility at the regional and global levels.

THEME 2:

Developing Education, Training, and Entrepreneurship Programs -

This theme addresses the skills gaps that limit industry growth. Goals related to education and workforce alignment (Goals 2, 4, 5, and 6) are advanced through targeted curriculum development, stackable credentials, and support for startups. These strategies ensure that Maine's workforce is prepared to meet current and future industry demands.

OUTCOMES AND IMPACT

The final goals (7 and 8) represent the measurable outcomes of implementing the two themes: economic impact and international competitiveness. Together, these efforts are projected to contribute up to $1.1 billion annually to Maine's GDP and create thousands of high-wage jobs by 2042. More importantly, the Roadmap charts a path for building a sustainable and inclusive workforce that drives innovation and secures Maine's position in the global space economy.

Supported by labor market data, stakeholder interviews, and best practices from leading space nations, the Roadmap serves as both a call to action and a practical blueprint for transforming Maine into a destination for space innovation, research, and advanced manufacturing.

The diagram below illustrates how the strategic goals of the Maine Space Workforce Roadmap impact key sectors and populations across the state:

K-12 & HIGHER EDUCATION

» STEM engagement and awareness (Goal 3)
» Stackable credentials and pathways (Goal 2)
» Space-aligned curricula (Goal 5)

TRADES AND INCUMBENT WORKERS

» Aerospace grade welding, machining, composites (Goals 5, 9)
» Reskilling in legacy industries (Goal 9)

STARTUPS & ENTREPRENEURS

» Mentorship and innovation hubs (Goal 6)
» Manufactoring and R&D capacity (Goal 4)

RURAL AND UNDERSERVED COMMUNITIES

» Distributed training access (Goals 2, 5)
» Youth pipeline expansion (Goals 3, 6)

INDUSTRY AND EMPLOYERS

» Workforce alignment and talent retention (Goals 1, 6)
» Economic Impact and supply chain expansion (Goal 7)

GOVERNMENT AND GLOBAL MARKETS

» GDP/job growth targets (Goal 7)
» International competiveness (Goal 8)

1. THE BIG OPPORTUNITY – WHY SPACE, WHY NOW?

THE PROMISE OF SPACE: Shifting Toward Ubiquity - Space is becoming increasingly integral to daily life and the global economy. Many everyday activities, such as navigation, ride-sharing, media consumption, and Internet access, rely on space-based technologies. From 2012 to 2022, the global space economy grew by 91% to $546 billion, and it's expected to grow another 41% in the next five years, reaching approximately $800 billion[1]. Analysts project that the space economy could surpass $1 trillion within a decade (Figure 1), with McKinsey forecasting a $1.8 trillion market by 2035, putting it on par with the microchip industry.

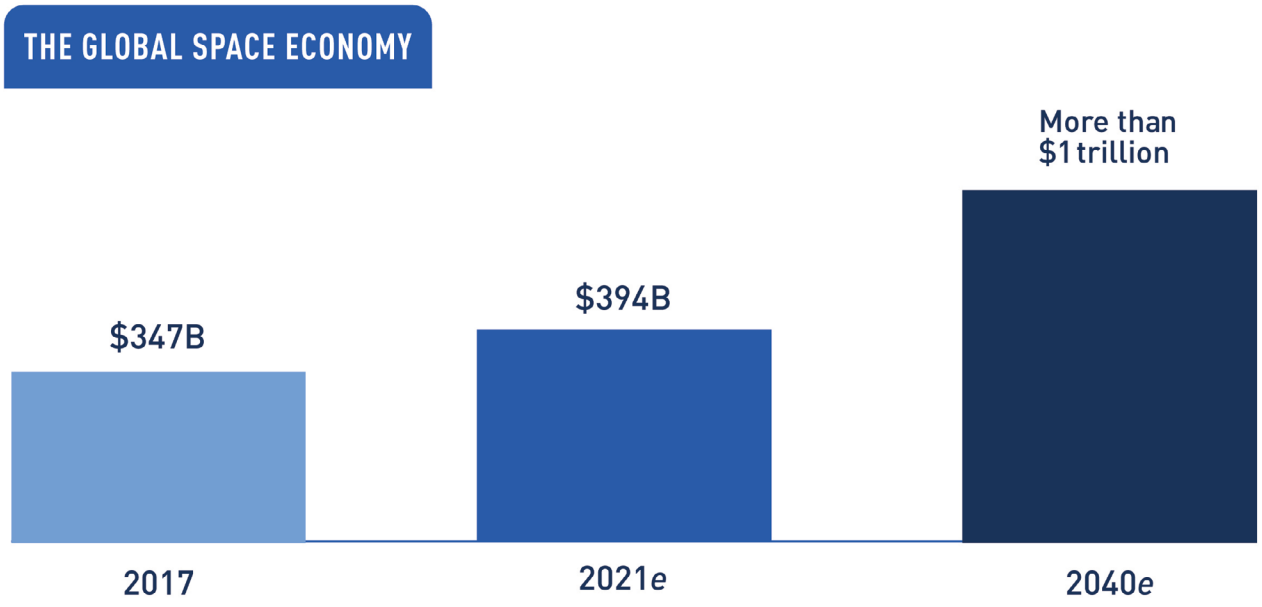

Figure 1: Projected growth of the global space economy.

SOURCE: HAVER ANALYTICS MORGAN STANLEY

[1] The Space Foundation, "Space Foundation Releases the Space Report 2023 Q2, Showing Annual Growth of Global Space Economy to $546B". Space Foundation. Space Foundation Releases The Space Report 2023 Q2, Showing Annual Growth of Global Space Economy to $546B

This rapid growth is driven by the commercial sector, which now accounts for 78% of the total space economy. Over 90% of today's spacecraft are commercial, signaling a major shift from the government-dominated space industry of the past. With the reduction in launch costs over the last two decades, private companies like SpaceX have entered the market, driving innovations in space exploration, satellite deployment, space tourism, and asteroid mining. Advancements in propulsion systems, materials science, and robotics are expected to revolutionize space missions, while resource utilization in space could support future space colonies and provide valuable materials for use on Earth.

THE EVOLVING SPACE ECONOMIC MODEL - The current space industry operates in a "Space-for-Earth model," where space-based technologies, such as satellites and space missions, are primarily used to improve life on Earth with technologies that support telecommunications, navigation, weather forecasting, and environmental monitoring. Unlike space exploration or colonization, which focuses on activities in space, this model emphasizes how space assets benefit industries and people on Earth by enhancing Internet access, managing resources, and improving security systems.

However, the industry is transitioning toward a "Space-for-Space economy," where economic activities occur entirely in space, independent of Earth's needs. This emerging economy, driven by Industry 4.0[2] technologies like automation, Internet of Things (IoT)[3], and software-driven development, envisions space businesses trading goods and services with other space entities. Activities such as space mining, manufacturing, tourism, and transportation will form the foundation of this new economy.

As more countries develop space programs and international competition intensifies, the global space industry is poised for significant growth, with many regions positioning themselves to capture a share of this evolving market. Over 90 countries now operate in space, with eight - U.S., China, Russia, the European Space Agency, India, Iran, Israel, and Japan – regularly launching orbitally. The U.S. accounts for 60% of governmental spending globally, split between civil and defense spending. As space becomes more accessible, a new space race has shaped as these countries vie for supremacy and control of the massive market potential beyond the Earth's surface. International competition will continue to drive growth across the space industry.

[2] Industry 4.0 refers to the fourth industrial revolution, which integrates digital technologies into manufacturing and industrial processes. It combines automation, data exchange, the Internet of Things (IoT), artificial intelligence (AI), and advanced computing to create "smart" factories where machines, systems, and humans interact seamlessly in real time. The goal of Industry 4.0 is to enhance efficiency, productivity, and flexibility in production while enabling innovations such as predictive maintenance, mass customization, and data-driven decision-making.

[3] The Internet of Things (IoT) refers to a network of physical objects, or "things," that are embedded with sensors, software, and other technologies to connect and exchange data with other devices and systems over the Internet. These objects range from everyday household items like smart thermostats and wearable fitness trackers to industrial machines and infrastructure systems. IoT enables these devices to collect, communicate, and act on data, allowing for automation, remote monitoring, and improved efficiency across various industries.

2. WHY MAINE? - MAINE'S NEW SPACE OPPORTUNITY

The origin of the Maine Space Complex resulted from a collaborative effort led by the Maine Space Grant Consortium. It began when the Consortium convened a meeting of state agencies, private companies, and academic institutions in March 2018 in Portland to confirm that Maine has the necessary assets (Figure 2) to play a large role in the nascent yet quickly growing 'new space' industry, and such a role would be key to achieving the following outcomes:

- **Retain Maine's students and Immigrants with STEM degrees.**
- **Attract highly skilled workers and their families from out of state.**
- **Encourage startups and spur development in all seven technology sectors.**
- **Develop globally based applications for research, commercial and consumer uses.**
- **Facilitate STEM learning opportunities for Maine high school and higher education students.**
- **Up-skill existing workforce with the skills required to support the space technology**
- **Promote economic aspirations for All Mainers.**
- **Advance Maine to a new competitive level in a fast-growing Knowledge Economy.**

MAINE'S NEW SPACE ECONOMY ASSETS

GEOGRAPHIC LOCATION FOR POLAR ORBITS - Offers direct and sun-synchronous polar orbit access (inclination angle between 80° and 100° from the equatorial plane for full Earth coverage.

COASTLINE FOR VERTICAL LAUNCHES - Lower population density and risk; an allowance for a southern launch.

PHYSICAL ASSETS AT LORING AND BRUNSWICK - Buildings and resources; allowance for horizontal launches.

SMALL BUT GROWING SUPPLY CHAIN - Directly and indirectly supplying the new space economy.

MAINE-BASED LAUNCH PROVIDERS - bluShift Aerospace and VALT Enterprises.

EDUCATION AND PUBLIC AND PRIVATE R&D ASSETS - UMaine System, Community College System, the Roux Institute, private colleges, non-profit research entities, CTEs, and Investment groups.

REGIONAL ASSETS - Higher Education institutions, high-tech industries

Figure 2: Maine's New Space Economy Assets.

The thought process is to leverage Maine's geographic advantages, including its proximity to polar orbits and existing infrastructure like Brunswick Landing (a former naval air station); Limestone (a former strategic Air Force base); an aerospace and defense supply chain; homegrown small launch vehicle startups; and academic and R&D strengths at public and private institutions in Maine and the New England region, to create a hub for small satellite launches, space research, and innovation.

Maine's easternmost position in the U.S. and abundant coastline create an ideal (and rare in the U.S.) location to launch small satellites, such as CubeSats (Figure 3), on small rockets into polar orbit (Figure 4). This natural resource, which was unveiled during this meeting, has the potential to make Maine competitive in the quickly growing high-tech space industry. With demand for polar launches climbing to new heights year after year, the time was right.

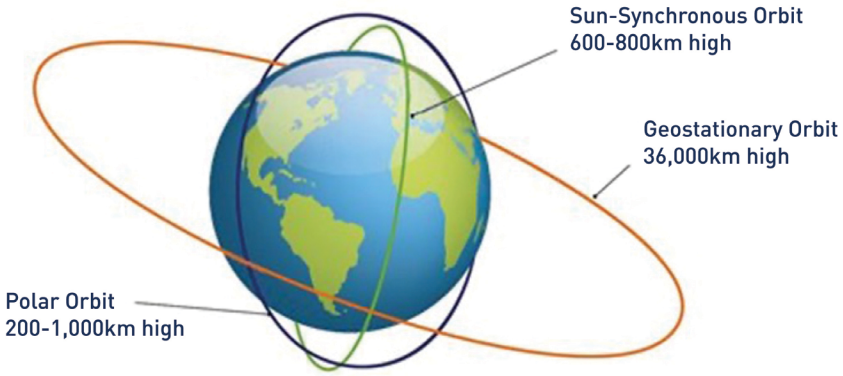

Figure 3: A CubeSat is a nanosatellite.

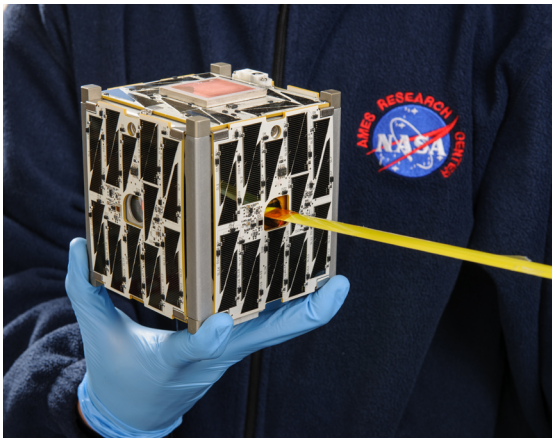

Figure 4: Polar vs Equatorial Orbits.

The high growth of the new space industry presents incredible economic opportunities for Maine businesses and entrepreneurs up and down the value chain. Maine is well-positioned to capture a meaningful portion of the projected growth in the global space economy. Maine has long been characterized by the resourcefulness and ingenuity of its people. Whether harvesting its woods or waters, Maine has repeatedly proven that it can transform its natural resources into industry to create livelihoods and grow its local economy to support its citizens.

Although innovative space research has been occurring in Maine for decades—from the development of a Mars vehicle re-entry system to sensor technology used to detect leaks in space habitats—there have been few opportunities and no well-established pathways into the space industry in Maine for graduates. As a result, the local economy has lost these bright minds to out-of-state jobs and the market potential of R&D as well, with no one to develop these ideas further.

Maine is home to 85 aerospace and defense companies that employ about 5,000 workers and serve the Commercial and General Aviation, Military Aircraft, and/or New Space sectors (Figure 5)[4]. Categorized by sub-sector, these companies exhibit depth in machining capability and modest progress toward automated processes. Other capabilities, but at lesser numbers, include advanced materials, launch vehicles, electronics manufacturing, information technology, telecommunications, and miscellaneous manufacturing; adjacent industries like defense and manufacturing can transfer capabilities to the space sector and support future industry growth.

Maine is also home to 20 companies employing about 1,000 workers that serve only the space industry and account for but a small portion of the overall A&D industry (Figure 11). These firms include three small launch vehicle companies—VALT Enterprizes, bluShift Aerospace and Promin Aerospace—and a variety of other companies that serve the industry. The largest concentration is small to medium-sized machining companies, and the current industry is clustered in the upstream portion of the value chain.

[4] *Dwinnells E, Ashlook J, Stahlhuth T, Shehata T. The Maine Space Complex Strategic Plan. Maine Space Grant Consortium (February 2022).*

3. OUR VISION

The corporation's vision is that by 2045, Maine will be an integral player in the emerging global network of suborbital and orbital space sector, providing a significant return on investment as an engine of workforce development and economic growth.

This vision is not simply about launching SmallSats in small rockets… it is about (a) engaging Mainers in the upstream, downstream, and space-related segments of the new space economy value chain (Figure 6) and the underlying infrastructure needed to support these segments, and (b) engaging

Mainers in developing technologies to return to the Moon and beyond (Figure 7).

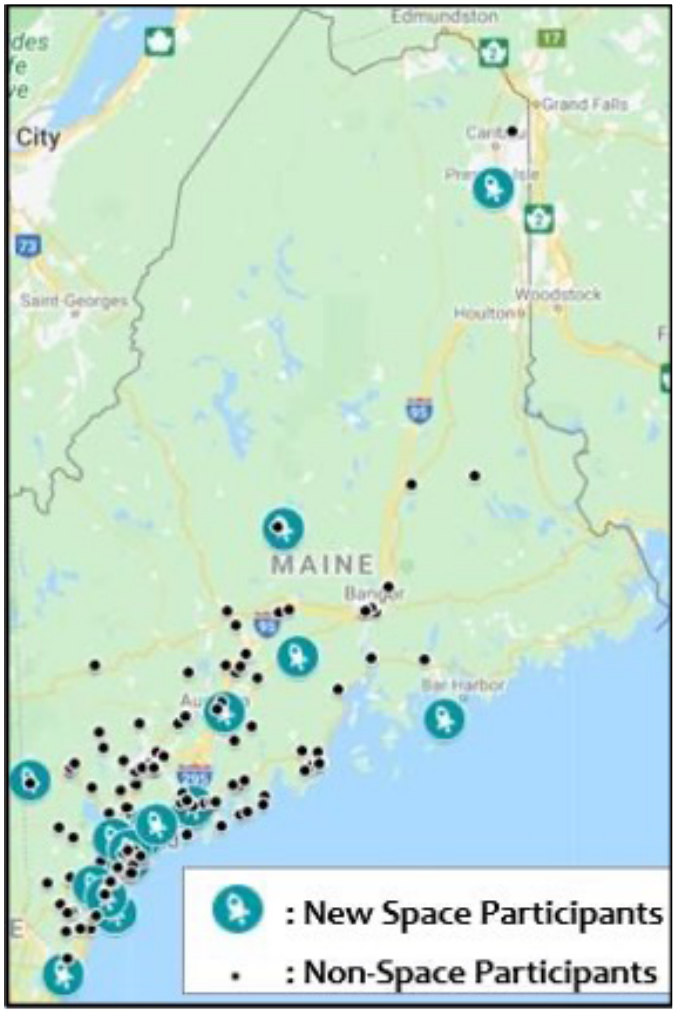

Figure 5: Geographical distribution of Maine businesses associated with the space industry.

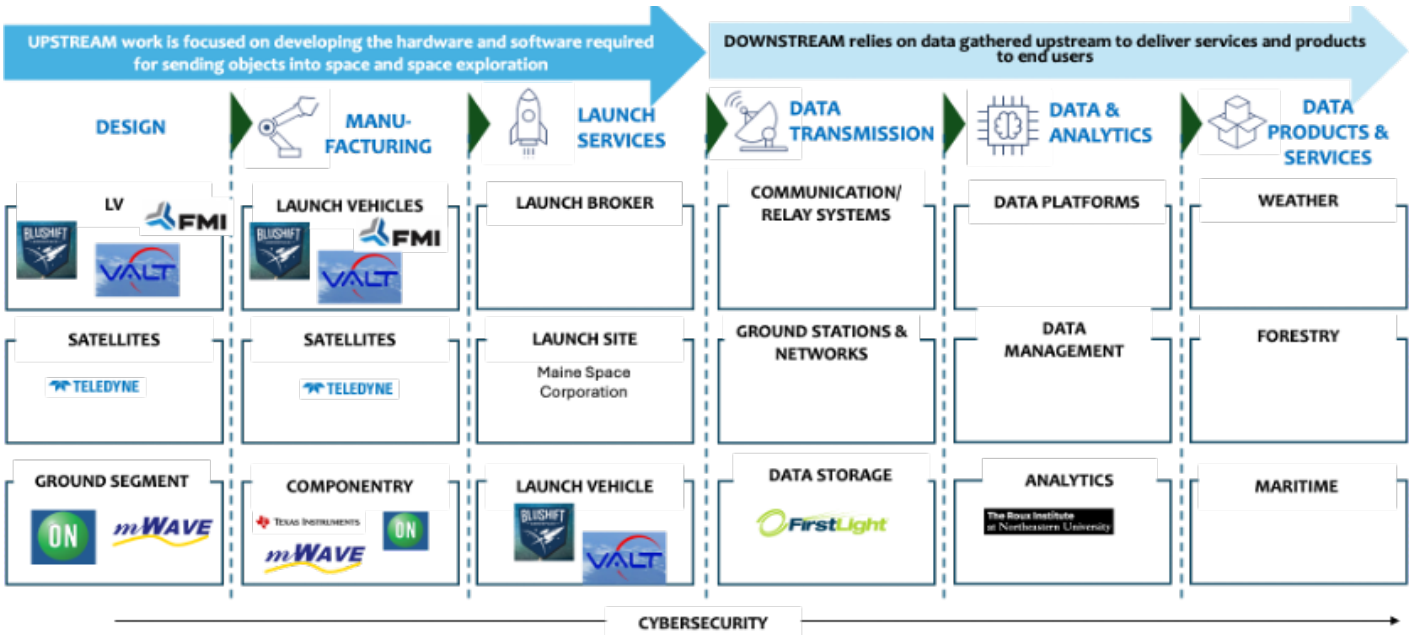

Figure 6: Upstream and Downstream Opportunities

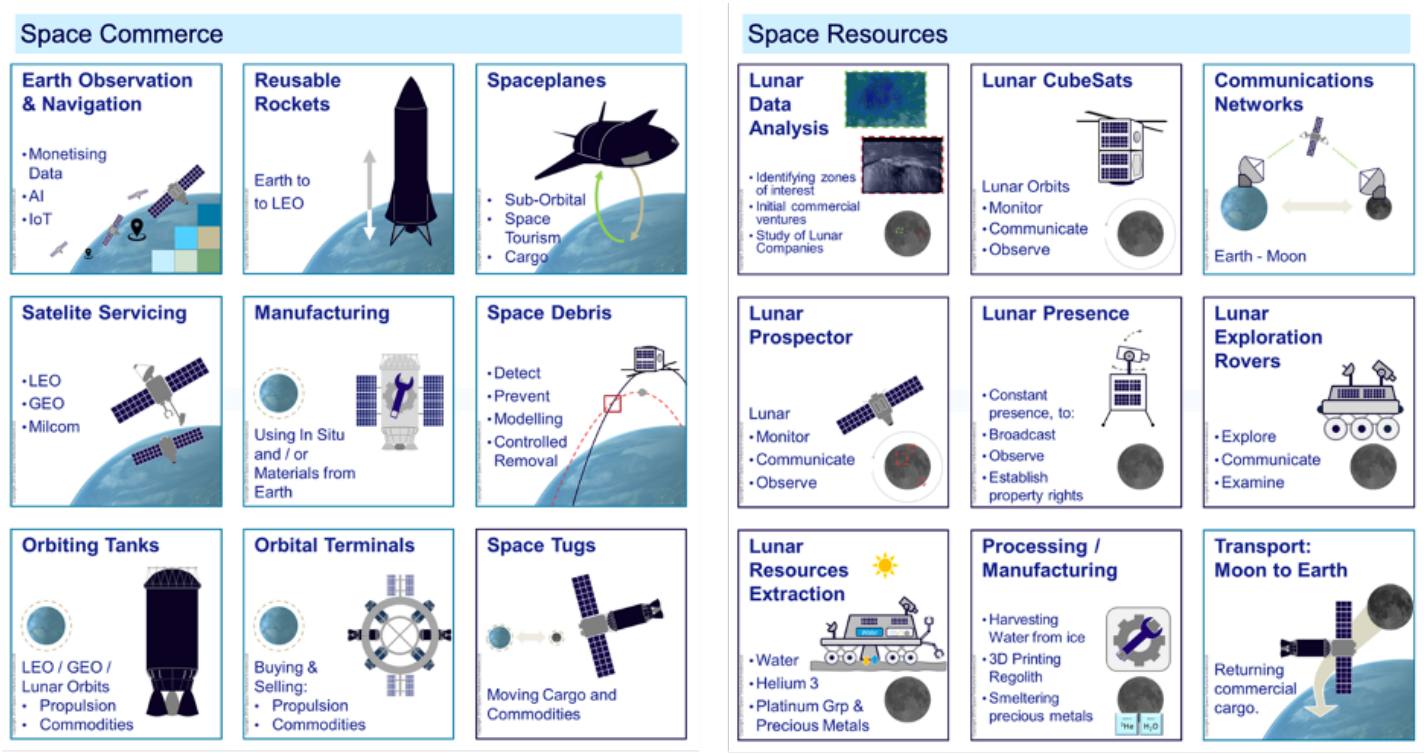

Figure 7: Space Technologies to Return to the Moon and Beyond

Finally, the corporation envisions swarms of SmallSats in low Earth orbits dedicated for Maine uses (Figure 8). This would represent a significant opportunity to position the state as a leader in the growing space industry, particularly in small satellite technology. CubeSats are small, cost-effective satellites for Earth observation, communication, and scientific research. A dedicated swarm of these satellites launched from Maine would enhance the state's capabilities in space-based services, potentially improving industries like agriculture, fisheries, forestry, and environmental monitoring through advanced data collection. It would also attract space-related businesses and investment, create high-tech jobs, and strengthen Maine's role in the national and international space economy while leveraging its geographic location for satellite launches into polar orbits. To achieve this vision and develop a robust new space economy, Maine must develop and attract companies that play across all aspects of the value chain, from launch and satellite manufacturing to data analytics and monetizable services.

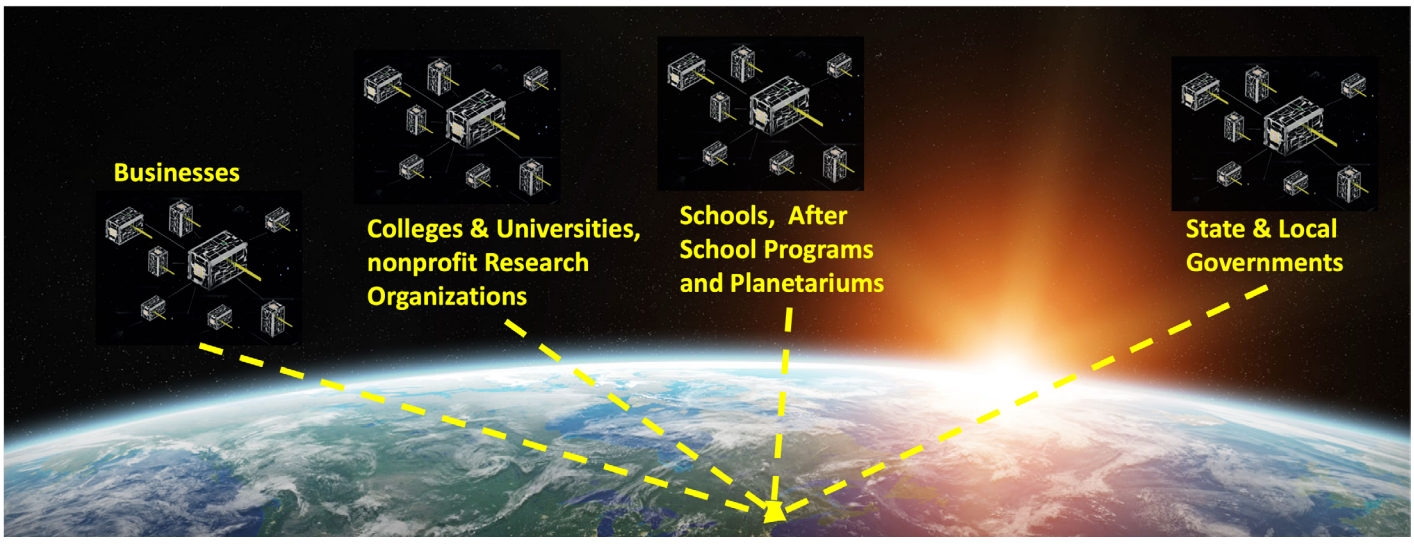

Figure 8: Maine dedicated swarms of CubeSats

4. INTRODUCING THE MAINE SPACE COMPLEX

A market demand study[5] funded by the Maine Technology Institute confirmed Maine's potential in the space economy, and input from space industry experts and private sector partners further shaped the project and set into motion a series of events that led the Governor and the Legislature to establish the Maine Space Corporation[6], a quasi-independent state entity to develop the Maine Space Complex (Figure 9) -- a geographically distributed complex composed of three business units to leverage the State's geographic, rocketry, manufacturing and higher education assets and capabilities to establish the State as a national and international industry destination and an authority in launching small launch vehicles and small satellites into polar orbit.

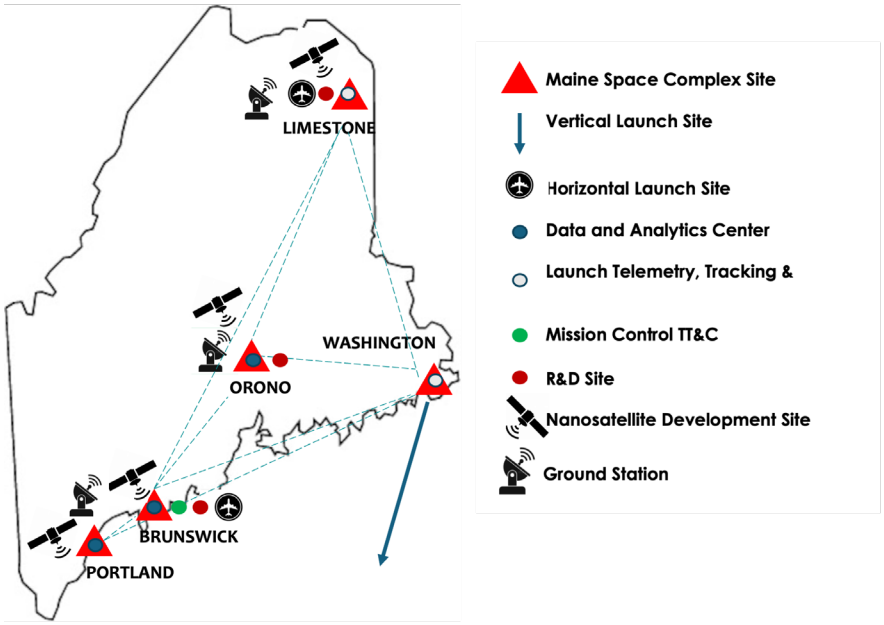

Figure 9: Geographically Distributed Maine Space Complex.

A key focus of the design was sustainability, ensuring minimal environmental impact while emphasizing workforce development and innovation. The complex was designed to house research facilities, satellite launch capabilities, and collaborative spaces, with partnerships forged with local universities to train the next generation of engineers and scientists. Public support, legislation, and federal funding from sources like NASA also played an essential role in bringing the design to life.

SPACE R&D & INNOVATION HUB - Research and development (R&D) is an essential activity that drives the innovation-to-commercialization cycle underpinning modern economic development. Although the more significant benefits of R&D and innovation processes are the emergence of new enterprises and private sector economic activity, the process of innovation and R&D itself also provides direct economic benefits as those activities occur. For these reasons, the Hub (Figure 9) will be an industry meeting place, a hub for new business incubation and acceleration, facilities for satellite and launch vehicle manufacturing and integration and ground control for satellite launch operations. The shared space must contain specialized equipment to facilitate business R&D, academic and scientific inquiry; continuing education capability for upskilling existing workforce with Industry required general skills, and a kindergarten to grade 12 learning center and must be designed to attract both in-state and out-of-state interests.

[5] *Market Demand Study for a Maine Space Complex (2020). Maine Space Grant Consortium. Project was funded by a grant from the Maine Technology Institute.*

[6] *The corporation is governed by a 17-member Board of Directors of the Maine Space Corporation. Six directors are ex officio, and 11 are non ex officio, appointed by the Governor and subject to confirmation by the Senate.*

Figure 10: A vision of the innovation hub.

Figure 11: Geographically Distributed Maine Space Complex.

SPACE DATA ANALYTICS AND ADVANCED ANALYTICS - Data analytics and related services utilize satellite data to provide data products and services to an ever-expanding market of industries and organizational end-users. This unit will be a state-of-the-art computer center with networks equipped to import or downlink, store, cleanse, manage, and analyze satellite data in concert with terrestrial data to innovatively address business and public issues and create new data products and services. There is uncertainty about the location of data analytic service providers since location decisions for these types of businesses do not require proximity to launch service operations. However, with the Roux Institute graduating students with data analytics degrees at the graduate level, the availability of the workforce may be a compelling reason to locate in Maine. This capability, while currently focused on analyzing data from space for industry on earth, will grow and evolve to meet the needs of a broader space-for-space economy in the future focused on the software development, programming, and analytics for increasing autonomous systems operating thousands of miles away.

LAUNCH FACILITIES AND SERVICES - Although temporary, the capital investment costs associated with the development and construction of vertical, horizontal and/or sea-based launch facilities and other supporting infrastructure will also provide economic benefits to Maine. Once built, the launch facility will serve customers launching small satellites primarily into polar orbit. This is the most in-demand orbit currently and is associated with earth observation, satellite Internet service, national security, and climate change data collection, among other critical data sets. While a critical and scarce piece of the value chain, Launch only accounts for a small fraction of total industry revenue. It can, however, accelerate the attraction of space manufacturing and data analytics companies to the state due to the proximity of launch services that are in high demand nationally and globally.

R&D and Data Analytics are driving most of the revenue in the space industry, and to provide a launch in their absence would be forgoing huge potential upside for the local economy. Developing capabilities across the value chain is also critical because the industry is evolving.

Figure 12: Land-based vertical launch site.

5. POTENTIAL ECONOMIC IMPACT – WHAT'S AT STAKE?

In the fall of 2022, the Center for Business and Economic Research (CBER) at the University of Southern Maine conducted an economic impact analysis on the Maine Space Complex[7]. The study developed revenue and market share forecasts for space complex business components drawing on several industry sources and experts. Four scenarios were simulated over an 18-year forecast using an economic model developed by Regional Economic Models Incorporated (REMI), beginning with construction in 2024 and ending in 2042. This assumes 2 years for development and construction, with launch operations ramping up in 2026 and a 15-year operational projection period of 2027 through 2042. The results indicate that a new space economy in Maine could contribute:

- **By 2042, the state GDP will add between $550 million and $1.1 billion annually (in fixed 2022 $).**
- **Between 2,800 and 5,500 good-paying jobs annually by 2042 while providing a significant source of tax revenues across the state.**
- **The average aerospace worker earns $77,232 or 70% more than average ($45,370).**

This analysis represents a subset of an industry's potential development paths. Although not a comprehensive evaluation of a space complex development, these simulations represent the potential impacts if a new space economy emerges in line with market forecasts and under the various scenarios simulated in this analysis. The potential impact of tourism revenue has not been included, but it could contribute significantly to additional gains. The development of the Maine Space Complex is well-aligned with the state's 10-year economic development strategy focused on innovation and talent.

6. THE WORKFORCE CHALLENGE – BRIDGING THE SKILLS GAP

A. CURRENT SKILLS GAP

Although Maine's current space workforce is small, the potential for growth in a high-tech, high-value-added, high-wage industry is enormous. Maine is poised to accelerate the growth of the local space industry with plans to develop a Maine Space Complex underway. Maine will need a sound and comprehensive workforce develop-

[7] *Wallace, R. D. The Economic Potential of a Space Complex and New Space Economy in Maine. Prepared for the Maine Space Grant Consortium. February, 2022.*

ment strategy to support this growth, with clear pathways for credentialed workers into the industry. While STEM education is critical to growing a next-generation workforce, it is not a strategy for economic growth.

Several space industry skills gap surveys conducted internationally serve as a proxy for unobtained information in the US market. The surveys represent a broad range of space industry companies globally recognized for their results. Space companies distinguish themselves from other global sectors through the need for independent subsidiary companies or operations in each country. Largely driven by national security concerns and the unique regulatory environments that come with them, this phenomenon causes duplicative ecosystems within each country/organizing body that operates a space agency, which allows companies to attain government contracts and the revenue that those provide. For this reason, this study considers two skills gap surveys and results from the United Kingdom Space Agency[8] and the Australian Space Agency[9] as generally representative of the commercial space industry in the United States. Globally, it is recognized that there is a broad range of skills that are in demand in the space industry, as portrayed by the Space CRAFT Framework (SCF)[10]. This Framework serves as the basis for the categories shown in Table 1 from the UK Space Skills gap survey. Organizations report the leading skills gap in software and data as a broader category from the Space CRAFT Framework.

Table 1: Reported skills gaps in current space workforce

Theme	% Organizations reporting skills gaps in their current workforce (n=101)
Software & data	72
Commercial operations	51
Electronics design	43
Sector support[11]	43
Systems engineering	39
Transferable skills[12]	38
Maintenance, manufacturing & materials	24
Spacecraft operations	23
Aero/mechanical design	21
Other	5

[8] *Thiemann, H., Dudley, J., Lecky, W., & Dallas, E. (2023). Space Sector Skills Survey 2023 Results. Space Skills Alliance.*

[9] *SmartSat 2021, Space Industry Skills Gap Analysis, SmartSat Technical Report no. 5, SmartSat, Adelaide, Australia.*

[10] *https://craft.spaceskills.org/*

[11] *Sector support refers to the assistance, resources, and initiatives provided to strengthen and promote the space industry. This support can come from government policies, financial incentives, infrastructure development, incubators, or workforce training, all aimed at fostering growth, competitiveness, and sustainability.*

[12] *Transferable skills in the space industry refer to abilities that can be applied across various roles or sectors, not just in spa*

B. CORE TECHNICAL SKILLS FOR MAINE'S SPACE INDUSTRY

Maine's space industry is emerging at the intersection of traditional industrial strengths and cutting-edge innovation. To develop a resilient and future-ready workforce, it is critical to identify and invest in core technical skills that enable participation across the full space value chain—from component manufacturing to data analytics and satellite operations.

These skills are not only vital to space-related activities such as satellite fabrication, launch support, environmental testing, and ground communications—they are also highly transferable to Maine's established sectors like shipbuilding, defense, clean energy, and biotech. Building capacity in these areas will not only prepare Maine workers for high-wage space careers but also enhance the state's competitiveness across multiple advanced industries.

Table 2 summarizes key technical skill categories and representative competencies required to meet the needs of Maine's space economy:

Table 2: Key Technical Skills Required to Meet the Needs of Maine's Space Economy

Skill Area	Representative Competencies
Advanced Manufacturing & Fabrication	Welding (TIG/MIG/orbital), CNC machining, 3D printing, composite fabrication, metrology
Electrical & Electronic Systems	Circuit board assembly, soldering, avionics, harness wiring, embedded systems
Environmental Testing & Qualification	Thermal/vacuum/vibration chamber operation, calibration, data logging, quality assurance
Systems Integration & Operations	Mechanical/electrical integration, payload interface testing, ground station operation
Software & Data Systems	Satellite ops software, GIS/remote sensing, Python/C++/MATLAB, cybersecurity, simulation tools
Space Systems Engineering & Design	CAD/CAE modeling, orbital mechanics, propulsion systems, flight software, payload design
Cross-Cutting Technical Skills	Clean room procedures, ISO/QMS compliance, diagnostics, technical documentation

ADVANCED MANUFACTURING

Advanced manufacturing is a foundational pillar of the industrial skill set required to support the growing space industry. As a discipline, it encompasses a wide range of techniques and technologies that enhance the precision, efficiency, and scalability of production processes—capabilities that are essential for designing, building, and testing space systems. From satellite components to launch vehicle structures, advanced manufacturing enables the fabrication of high-tolerance, mission-critical parts using methods such as CNC machining, additive manufacturing (3D printing), composite fabrication, and automated welding.

What distinguishes advanced manufacturing in the space sector is its integration of core industrial skills in fabrication, metrology, industrial maintenance, and CAD/CAM design—into streamlined processes that meet the extreme performance standards required for spaceflight. These same skills also serve traditional industries such as shipbuilding, aerospace, and defense, making them highly transferable across Maine's broader economy.

By embedding advanced manufacturing into workforce training and economic development strategies, Maine can not only meet the specialized needs of the space industry but also strengthen its industrial base overall. As the space economy scales, the ability to produce components locally and rapidly—through skilled tradespeople using advanced tools—will be key to sustaining innovation, attracting investment, and securing Maine's position in the national space value chain. These technical competencies are not only critical for space vehicle manufacturing and testing, but they are also highly transferable to the state's traditional industries including shipbuilding, marine trades, advanced materials, and defense contracting. Investing in these skillsets will simultaneously strengthen Maine's legacy industrial base and build a flexible workforce pipeline for space. However, current training programs in Maine require expansion and modernization to meet the more demanding requirements of aerospace and space-related applications. To build a future-ready workforce, Maine must integrate the these skill areas into a coordinated development framework. These skills cut across welding, manufacturing, electronics, automation, and operations, creating a synergistic foundation for the state's space industry.

MAINE'S SUPPLY CHAIN GAP

An analysis[13] of the supply chain gap associated with engaging Maine's advanced manufacturing industry in the space industry identified five skills (Industry 4.0, Data Analytics, Advanced Materials, Quality Management Systems (QMS) and Lean/six sigma). Another key area identified is Advanced Product Quality Planning (APQP)which has been adopted by the aerospace, electronics, automotive and wind industries for guidance in prod-uct and process development. Collectively, these skills are recognized as deficient skills among several Maine industries, including the Space Industry, and are contributing factors to business growth. According to the analysis, Maine presently has almost no organized training programs in QMS and Lean / Six Sigma focusing on the two lower levels of the Workforce Pyramid (operators and technicians) that comprise most of the workforce.

In addition, aerospace suppliers aiming to grow their business with industry primes must pursue key quality certifications—AS9100 and ISO9001—which formalize quality management systems and reduce contracting risks. While AS9100 is specific to aerospace and addresses aviation and defense requirements, only 28.2% of Maine aerospace firms currently hold this certification, with many citing it as too costly and burdensome. Similarly, just 27.8% are ISO-certified, with small companies across sectors reporting that the resource demands and expense outweigh the perceived benefits. In parallel, a Maine Space Grant Consortium study assessed how well these firms are adopting Industry 4.0 practices—such as automation, additive manufacturing, and data integration—using a 0–4.75 scale across organizational, technical, and managerial criteria. Maine firms averaged a score of 2.0, indicating they are falling behind in Industry 4.0 readiness, although their engineering strengths showed relative promise.

[13] Schoenberg, A. and Von Vogt, S. (2022). Workforce development needs of Maine's Advanced Materials Industry to participate in the Space Industry. Maine Space Grant Consortium. Funded by the grant from the U.S. Department of Commerce Economic Development Administration and the Maine Technology Institute.

C. FUTURE SKILLS DEMAND

When analyzing future skills needs for the Space workforce, the UK Skills Survey found the results shown in Table 3. Artificial intelligence and machine learning were the skills the highest percentage of respondents expect to be needed in the next 3 years, followed by strategy and leadership, project management, technical leadership, and data analysis and modeling to round out the top 5.

Table 3: Skills in the Future Space Workforce.

SKILL	THEME	% EXPECTING TO NEED SKILL IN 3 YEARS (N=101)
Artificial Intelligence and machine learning	Software & data	70
Strategy and Leadership	Commercial operations	57
Project Management	Transferable skills	49
Technical leadership	Transferable skills	47
Data analysis & modeling	Software & data	44
Software engineering	Software & data	44
Software engineering	Systems engineering	42
Problem solving	Transferable skills	40
Data processing & manipulation	Software & data	38
Sales & commercial	Commercial operations	37
Teamwork	Transferable skills	36
Data visualization	Software & data	35
Assembly, integration and testing	Maintenance, manufacturing & materials	34
Communication	Transferable skills	34
Manufacturing and materials	Maintenance, manufacturing & materials	32
Funding and incubation	Sector support	32

D. GAPS IN TRAINING AND EDUCATIONAL OPPORTUNITIES

The matrix in Table 4 captures the major subsectors of the current and future space economy, the related skills, and cross-references the skills required with training and educational opportunities currently available, missing or underdeveloped in Maine and the Region, either through a Career and Technical Education (CTE) school, community college, four-year program, or graduate program.

Table 4: Distribution of Available Training and Educational Opportunities for Upgrading Critical Skills Required for Maine's New Space Economy.

TABLE KEY: **NONE:** **SOME:** **MANY:**

SECTOR	K-12	CTE/ ASSOCIATES	UNDERGRAD	GRADUATE/ POST-BACC	INDUSTRY EXPERIENCE	CONT. ED./ CERTIFICATE	ADULT ED
LAUNCH & SPACECRAFT DEVELOPMENT							
Propulsion System							
Flight & Computing Avionics							
Guidance, Navigation & Control							
Space Systems Electrical Power							
Thermal Management Systems							
Fluid Dynamics							
SATELLITE PAYLOAD AND SENSOR DEVELOPMENT							
On-Board Data Subsystems							
Sensors & Instruments							
SATELLITE PAYLOAD & GROUND-BASED TECHNOLOGY DEVELOPMENT							
RF Subsystems, Payloads & Technologies							
Electromagnetic Technologies & Techniques							

SECTOR	K-12	CTE/ ASSOCIATES	UNDERGRAD	GRADUATE/ POST-BACC	INDUSTRY EXPERIENCE	CONT. ED./ CERTIFICATE	ADULT ED
Optics							
Optoelectronics							
Position, Navigation & Timing Technologies							
Internet of Things Technologies							
SPACE EXPLORATION TECHNOLOGIES DEVELOPMENT							
Robotic Systems							
Autonomous Systems							
Planetary Body Exploration							
Entry, Descent & Landing							
In-Situ Resource Utilization							
Human Health, Life Support & Habitation Systems							
SPACECRAFT MECHANISMS, STRUCTURES, & MATERIALS DEVELOPMENT							
Mechanisms							
Structures							
Materials & Manufacturing Processes							
Electrical, Electronic & Electro-mechanical (EEE) Components + Quality							

SECTOR	K-12	CTE/ ASSOCIATES	UNDERGRAD	GRADUATE/ POST-BACC	INDUSTRY EXPERIENCE	CONT. ED./ CERTIFICATE	ADULT ED
GROUND SYSTEMS TECHNOLOGIES & SERVICES							
Ground Station Systems & Networks							
Mission Operations & Ground Data Systems							
Ground, Test & Surface Systems							
SPACE ENVIRONMENT MONITORING TECHNOLOGIES							
Space Situational Awareness							
Space Situational Awareness							
SPACE SYSTEM PROJECT MANAGEMENT							
Management of Space Projects							
Systems Design & Verification							
Quality, Dependability & Safety							
SOFTWARE, PROGRAMMING AND COMPUTER							
Software used with Space Systems							
Remote sensing/ EO Software							
Software, Modeling, Simulation + Info Processing							
Flight Dynamics and GNSS							

SECTOR	K-12	CTE/ ASSOCIATES	UNDERGRAD	GRADUATE/ POST-BACC	INDUSTRY EXPERIENCE	CONT. ED./ CERTIFICATE	ADULT ED
AI and ML							
VR Technologies							
Quantum Computing Technologies							
Cybersecurity & Resilience Technologies							
SPACE APPLICATIONS							
Satellite Communications Services & Applications							
EO Services + Applications							
Global Position-ing, Nav, Timing Services & Apps							
Other Space Applications							
SPACE SECTOR ENABLING SKILLS							
Regulation & essential service delivery							
Space education and outreach							
Space Related R+D & Engineering							
Specialized Support Services							

SECTOR	K-12	CTE/ ASSOCIATES	UNDERGRAD	GRADUATE/ POST-BACC	INDUSTRY EXPERIENCE	CONT. ED./ CERTIFICATE	ADULT ED
SOFT SKILLS							
Communication Skills							
Interpersonal Skills							
Leadership							
Self-manage-ment							
Influencing and Persuasion Skills							
Creative Thinking							
Adaptability							
Decision Making & Problem Solving							
ADVANCED MANUFACTURING							
Aerospace Welding & Fabrication (AWS D17.1)							
Precision Machin-ing (5-axis/CNC)							
Composites Layup & Testing (incl. clean room)							
Clean room Pro-tocols & Contami-nation Control							
Non-Destructive Testing (Ultrasonic/X-ray)							
Robotic Manufacturing & CNC Automation							

E. SUMMARY OF MAINE SPACE WORKFORCE FINDINGS

1. There is a pervasive lack of awareness at the K-12, higher education, and mid-career professional level as well as in adjacent industries surrounding jobs and opportunities in the space industry outside.

2. Although there are many qualified graduates for entry-level jobs, finding experienced workers—particularly those with specialized hands-on skills in aerospace-grade welding, machining, composites, and clean room integration—is significantly more challenging. These mid-skill technical roles are foundational to the space industry and require targeted upskilling programs to bridge the experience gap.

3. There is interest in and excitement about space in the K-12 population. However, many students count themselves out of the profession because they don't believe their skills and strengths align with space jobs, and STEM graduates are declining across the U.S.

4. Maine's workforce is aging across the board and leaving the workforce at a higher rate than younger entrants are joining.

5. Space is R&D intensive, and Maine's R&D investment is lower than the national average.

6. There are few space education opportunities in higher education institutions in Maine, although there are several in the Northeast U.S.

7. Many adjacent industry participants, particularly in Tier 3 (e.g., fabrication, marine trades, machining), could participate in the space industry if provided with targeted training aligned with aerospace standards (e.g., AWS D17.1, IPC-A-610, ASNT Level II). These firms and workers offer immediate potential for rapid expansion of Maine's space manufacturing capacity.

8. While there is no shortage of capable graduates, few have space life-cycle experience, making on-the-job training and additional space industry training necessary.

9. There is a significant lack of upskilling programs in advanced materials, composites fabrication, clean room operations, and non-destructive testing—especially for entry-level and mid-career trades workers. This gap limits the ability of Maine's workforce to meet aerospace production and environmental testing needs. Programs must be rapidly developed and deployed in rural regions, community colleges, and mobile training labs.

10. There is a shortage of training programs tailored to aerospace-grade standards in welding, machining, and electronics integration. Most existing trade programs prepare students for general industry, not for the unique tolerances, materials, and protocols used in space systems. Expanding credentials like AWS D17.1 (aerospace welding), ASNT (non-destructive testing), and clean room protocols is critical to building a space-ready workforce.

11. Many workers in Maine's traditional industries (shipbuilding, metalworking, and precision fabrication) possess transferable skills but lack access to short-term upskilling aligned with space industry needs. These incumbent workers could serve as a fast-start labor pool if provided with flexible, modular certifications and employer-recognized credentials.

12. Few programs in Maine train workers on clean room fabrication, contamination control, or the operation of vibration tables and thermal vacuum chambers. These skills are essential for satellite integration and environmental qualification testing. Partnerships with technical colleges and industry are needed to fill this gap.

13. Experienced professionals are challenging to find, particularly in software programming because they are in high demand by other tech companies that can pay more premium salaries.
14. There is a diversity issue in the space industry.

15. There is low public and educator awareness about Maine's space industry and career opportunities. This limits student engagement, teacher advocacy, and community support. A coordinated outreach strategy is needed—especially within schools and families.

16. Space-related content should be embedded across K-12 curriculum—not treated as extracurricular or one-off activities. Integration must align with state standards and be supported by teacher professional development and accessible curriculum resources.

17. Teachers are key champions but face barriers like limited time, lack of incentives, and inconsistent access to training. Providing paid PD, CEUs, and ready-to-use resources would increase participation and sustainability.

18. Many Tier 3 companies and schools don't know how to engage with each other or the broader space ecosystem. A centralized clearinghouse or industry-education connector is needed to improve collaboration and share resources.

19. Industry prefers free, online, or on-site training. Micro-credentials and stackable certifications (e.g., in composites, quality systems) are more attractive than long, traditional programs—especially for incumbent workers and smaller employers.

7. STRATEGY IN ACTION: BUILDING MAINE'S SPACE FUTURE

Building a strong and sustainable space industry requires a comprehensive approach that integrates education, workforce development, and business engagement. Central to these efforts is raising awareness about career opportunities in the space sector and ensuring that all students and professionals are supported and have access to these opportunities. By creating space-focused coursework and Industry 4.0 training programs that are accessible to a broad range of individuals, these initiatives aim to cultivate a skilled workforce. Additionally, promoting the space industry both nationally and internationally helps ensure that people from all communities can access career pathways, while the Maine Space Complex strives to be a leader in fostering broad participation in the global space market.

To this end, Section 7 outlines several strategies organized under two major themes: Awareness and Education, Training and Entrepreneurship. Each strategy emphasizes the importance of building a supportive environment for the Maine space industry by expanding access to education, training, and career pathways. This includes ensuring that space-focused programs and opportunities are widely available to students and workers across the state, especially those who may face geographic or economic barriers. Initiatives may involve offering scholarships, mentorship, and internships to help develop a skilled talent pipeline. Companies and organizations are encouraged to adopt hiring practices that help attract and retain qualified professionals from across Maine's communities. Additionally, partnerships with schools, workforce boards, and community organizations can help raise awareness about careers in the space sector and connect more people to opportunities. By embedding these strategies into the industry's development, Maine can build a workforce that is broadly representative of its population and fully prepared to support growth in this emerging field.

THEME 1: RAISE AWARENESS, ENGAGEMENT, AND FOSTER COLLABORATION

Each strategy engages stakeholders—students, educators, businesses, and regional institutions—to promote the space industry and its career opportunities. Additionally, a strong emphasis is on building partnerships between educational institutions and businesses while positioning Maine as a key player in the national and international space sectors.

STRATEGY 1: CAST A WIDE ENGAGEMENT NET.

To effectively support the growth of Maine's space industry, workforce development strategies must go beyond traditional pipelines and actively engage a broader spectrum of worker populations. While underrepresented groups, students, and displaced workers remain a priority, the roadmap must also focus on tradespeople, incumbent workers, and individuals already active in Maine's legacy industries—such as shipbuilding, precision machining, marine trades, and fabrication—who possess highly transferable technical skillsets.

These workers represent a fast-start, technically capable labor pool that can be rapidly upskilled with targeted aerospace certifications and training. Programs that introduce standards like AWS D17.1 (welding), ASNT Level I/II (non-destructive testing), IPC-A-610 (electronics), and clean room protocols can convert existing regional talent into 'space-ready' technicians. This approach supports not only the space industry but also strengthens Maine's traditional sectors by embedding advanced capabilities across industries. In addition to traditional workforce development targets, Maine should prioritize engagement with:

- **Skilled tradespeople in manufacturing, welding, and marine fabrication**
- **Incumbent workers in traditional and legacy industries (e.g., shipbuilding, composites, electronics)**
- **Dislocated workers from forestry, paper, and other declining sectors with transferable technical skills**
- **Rural CTE and community college graduates seeking specialized technical certifications**
- **Veterans with hands-on technical or logistics experience**
- **Underrepresented and underserved groups including women, BIPOC, and first-generation students**
- **Youth and young adults, particularly in rural and coastal counties, with exposure to STEM and skilled trades**
- **Workers with Industry 4.0-adjacent skills such as robotics, automation, and digital design**

STRATEGY 2: LAUNCH K-12 OUTREACH AND "SPACE IN SCHOOLS" PROGRAMS.

This strategy focuses on generating early interest and sustained engagement in space-related careers by exposing K-12 students, educators, and school leaders to the vast opportunities across the space sector. It also aims to help schools connect classroom learning to real-world applications and career pathways in science, technology, engineering, and manufacturing. Tactics include:

1. Launch a 'Space in Schools' Outreach Initiative by coordinating a traveling speaker series and hands-on activities with professionals from Maine's space industry to visit schools across all counties.

2. Host an Annual Maine Space Day by partnering with the Maine Space Grant Consortium and local organizations, museums, and universities to host statewide events that showcase space missions, technologies, and careers through exhibits, demonstrations, and career talks.

3. Develop a Space Career Exploration Toolkit for Educators to create grade-appropriate lesson plans, career pathway maps, and classroom materials that highlight the diversity of careers in space—from satellite design to data science.

4. Integrate Space Content into Existing STEM Programs by working with existing STEM education programs and after school clubs to include space-themed activities and competitions.

5. Facilitate Educator Professional Development to offer workshops, webinars, and summer externships for teachers to connect with the space industry and incorporate it into classroom instruction.

6. Showcase Student-Driven Space Projects by organizing statewide student showcases or competitions where teams present rockets, CubeSat models, or Earth observation projects.

7. Promote Dual Enrollment and Early College Programs to raise awareness of high school programs that offer college credit in STEM or aerospace-related fields and how these align with space career paths.

8. Create a Digital Hub for K-12 Space Learning by launching a dedicated website with virtual tours, career videos, educator resources, and links to internships and scholarships.

9. Collaborate with Guidance Counselors and Career Advising Networks to provide training and resources to school counselors to help them advise students about space-related fields and educational pathways.

10. Engage School Administrators in Industry Awareness Events by inviting principals and superintendents to space facility tours and policy roundtables to encourage systemic support for space education in schools.

STRATEGY 3: ORGANIZE COMPETITIONS AND HANDS-ON PROJECTS TO STIMULATE REAL SPACE MISSIONS.

To prepare students and recent graduates for careers in the space industry, Strategy 2 focuses on supporting space-focused competitions that simulate the full life-cycle of a mission: design, build, launch, operate, and downlink. These experiential learning activities bridge academic knowledge with real-world technical and project management skills, improving workforce readiness and innovation capacity. Tactics include:

1. **Launch an annual competition where student teams design, build, and test small satellites or payloads.**
2. **Ensure phases include mission planning, engineering, integration/testing, simulated launch, and operations.**
3. **Integrate competitions into coursework or capstone projects across community colleges and universities.**
4. **Enable student use of space qualification tools such as vibration tables and thermal vacuum chambers.**
5. **Align competition content with industry standards and workforce demands.**
6. **Reduce barriers by funding materials, mentors, and student support.**
7. **Partner with regional launch providers or national programs to give students real launch opportunities.**
8. **Include a telemetry/data phase for hands-on learning in mission operations.**
9. **Provide software-based design/test tracks for teams without hardware access.**
10. **Host an annual Space Innovation Day for public presentations and recognition by industry and government.**

STRATEGY 4: HELP BUSINESSES PIVOT INTO SPACE BY OFFERING WORKSHOPS, GRANTS, AND MATCHMAKING TOOLS.

This strategy focuses on equipping Maine businesses—including those in adjacent industries—with the knowledge, tools, and resources to identify, pursue, and participate in the growing space economy. Tactics include:

1. Host Space Economy Briefings & Roundtables by organizing industry-focused events to introduce local businesses to commercial space trends, supply chain needs, and contract opportunities. Feature prime contractors, NASA representatives, and local case studies.

2. Develop and Distribute Industry Opportunity Guides as sector-specific handbooks (e.g., composites, machining, electronics) showing how businesses can pivot into or support space-related activities.

3. Offer Technical Assistance & Readiness Assessments by partnering with organizations like the Maine Manufacturing Extension Partnership to assess company readiness for space work—e.g., certifications, tolerances, documentation.

4. Launch a 'Space for Business' Awareness Campaign to share success stories and opportunities through videos, newsletters, and digital platforms to reduce barriers and increase interest.

5. Engage Trade Associations & Sector Councils to offer briefings, presentations, and targeted outreach to member businesses.

6. Create a Space Supplier Matchmaking Directory by developing a searchable directory linking Maine businesses with space industry needs—covering everything from materials to testing.
7. Integrate Space into Economic Development Programs by incorporating space opportunities into the programming of local and state development agencies, accelerators, and innovation centers.

8. Facilitate Site Visits to Space-related Facilities by organizing tours of launch providers, test labs, and space-related manufacturers to inspire and educate business owners.

9. Offer Mini-Grants for Market Feasibility Studies by providing small-scale financial support to help businesses explore how their offerings could be adapted to serve the space sector.

10. Promote Federal and Prime Contracting Resources to guide businesses to platforms like SAM.gov and NASA's supplier portals; educate them on SBIR/STTR and other procurement pathways.

STRATEGY 5: FORM A CONSORTIUM OF SCHOOLS AND COLLEGES TO ALIGN EDUCATION WITH WORKFORCE NEEDS.

This strategy aims to establish a formal network of higher education, associate's programs, high schools and K-12 schools both in-state and out-of-state to better align academic programs with workforce needs, enhance information sharing, and publicize opportunities and events related to the space sector. Tactics include:

1. Create MOUs or partnership agreements with universities, community colleges, and technical schools in Maine and the region to participate in the consortium.

2. Form an advisory board composed of academic, industry, and state agency representatives to guide consortium activities and ensure alignment with workforce priorities.

3. Host annual or semi-annual meetings to update educational partners on hiring trends, internship opportunities, and anticipated skills needs in the Maine space sector.

4. Develop an online portal or shared calendar for consortium members to access job postings, career fairs, training opportunities, and industry events.

5. Inventory curricula across partner institutions and align course offerings and credentials with Maine's growing space-related occupations.

6. Coordinate internships, apprenticeships, and research fellowships that place students in Maine space companies or government labs.

7. Publicize space-related career pathways, academic programs, and industry collaborations through co-branded events, webinars, and media campaigns.

8. Use the consortium framework to pursue federal and private funding opportunities that support space education, training, and research.

9. Create a mechanism for space professionals and educators to share expertise across institutions and deliver specialized instruction.

10. Establish metrics for student engagement, employer satisfaction, and employment outcomes, and report results annually to stakeholders.

STRATEGY 6: POSITION MAINE AS A NATIONAL AND INTERNATIONAL VOICE IN THE SPACE INDUSTRY.

This strategy positions the Maine Space Corporation as the central convening entity and representative voice for the state's growing space economy. By serving as a regional space industry association, the Corporation will advocate for the needs and priorities of space-related businesses, researchers, and entrepreneurs. This strategy ensures that Maine's space industry is effectively represented in policy discussions, workforce development planning, and academic-industry partnerships. Acting in this capacity will strengthen coordination across sectors, align resources to industry demand, and accelerate the development of a thriving and collaborative space ecosystem in Maine. Tactics include:

STRATEGY 7: RAISE INTERNATIONAL AWARENESS OF THE MAINE SPACE COMPLEX.

This strategy aims to position the Maine Space Complex as a globally recognized hub for innovation, research, and commercialization in the New Space economy. By elevating international awareness, this strategy seeks to attract foreign investment, foster cross-border partnerships, and draw top-tier talent and companies to Maine. Establishing Maine as a destination for international collaboration will enhance the state's competitiveness, expand its influence in global space markets, and accelerate the growth of a resilient, export-oriented space ecosystem. Tactics include:

1. Members of Maine Space Corporation should attend major industry events and speak at Conferences in the US and abroad
2. Pursue DOD, NSF, USDA, EDA, and NASA funding opportunities
3. Develop relationships with AIAA and other national space-related trade organizations
4. Partner with instate organizations and provide collateral for distribution at events, conferences, meetings, etc. Ex. MITC, Loring Commerce Centre, DECD, Brunswick Landing and others to publicize Maine's space opportunity through various channels nationally and internationally.

THEME 2: DEVELOP EDUCATION, TRAINING AND ENTREPRENEURSHIP PROGRAMS

Each strategy aims to enhance the knowledge and skills of students and workers by creating space-related curricula, integrating Industry 4.0 technologies, advanced materials processing (including metals, ceramics, adhesives, coatings, etc...) and composites training to up-skill workforce, and partnering with organizations for specialized training and certifications. Of particular interest is the 22 modules identified by the MCA that make up the advanced manufacturing Quality Management System that will be required to compete. The overall goal of this theme is to ensure that Maine has a well-prepared workforce to meet the demands of the growing space industry.

STRATEGY 1: CREATE SPACE-FOCUSED COURSEWORK AT ALL LEVELS FROM HIGH SCHOOL TO GRADUATE SCHOOL.

This strategy focuses on building a robust educational foundation to prepare students for careers in the rapidly evolving space industry. By integrating space-focused coursework across associate, bachelor's, and advanced degree programs, this strategy aims to increase student awareness of industry trends, emerging technologies, and the complete space mission life-cycle—from design and manufacturing to launch and data utilization. The goal is to cultivate a pipeline of knowledgeable, industry-ready graduates who can contribute to Maine's growing space economy and meet the talent demands of both regional and national space enterprises. Tactics include:

Bachelor's Degree Programs (Non-Mechanical Engineering) – Establish coursework in Space Systems, Space Industry, Life-cycle, Entrepreneurship, Space Computer Science, and In-Space Manufacturing. Offer a variety of classes outside mechanical engineering to broaden student exposure to the space industry. This can be accomplished by collaborating with industry to identify high-impact areas for additional coursework and partnering with the University of Maine to enhance its Aerospace Engineering concentration into a minor or major.

Associate's Degree / Community College - Propose space-focused coursework and degree programs aligned with industry needs.

1. **Use Alfond upskilling funds for short-term credentialing of employees.**
2. **Develop space-themed associate degrees that prepare graduates in two years.**
3. **Collaborate with SMCC, Washington County/Calais, and Northern Maine CC at Presque Isle to increase space system emphasis.**

Career and Technical Education (CTE) Schools - Provide diverse space-related classes to non-mechanical engineering students.

1. **Explore dual enrollment to supplement space education where lacking.**
2. **Identify CTE schools with appropriate reach to specialize in space programs.**
3. **Address supply-demand imbalance; consider satellite programs at schools or employer locations (e.g., Cianbro welding program).**
4. **Start with one CTE to pilot a space-focused curriculum.**
5. **Find opportunities in existing programs to integrate space systems coursework**

STRATEGY 2: EXPAND INDUSTRY 4.0 TRAINING WITH A SPACE LENS.

This strategy supports the advancement of Industry 4.0-aligned education and training programs that prepare workers for evolving technologies and practices relevant to the space industry. These programs will integrate emerging manufacturing, digital, and data-driven competencies with practical applications for space-focused innovation and production along the value chain. Tactics include:

1. Embed space-relevant applications into existing Industry 4.0 curricula by working with community colleges and technical programs to incorporate space-specific case studies, standards, and components into programs focused on automation, additive manufacturing, robotics, and advanced materials.

2. Develop new credentials for space-ready Industry 4.0 Skills by creating micro-credentials or certificates that blend Industry 4.0 disciplines with space sector competencies, such as clean room manufacturing, satellite component testing, or aerospace-grade quality control.

3. Establish cross-sector faculty development programs to provide professional development for instructors in advanced manufacturing and engineering so they can integrate space technologies and standards into their teaching.

4. Partner with space companies on curriculum co-design by engaging small launch providers, component manufacturers, and space tech firms in shaping training content and identifying emerging workforce needs.

5. Offer space-focused capstones and applied projects to encourage students in advanced manufacturing and engineering tracks to pursue space-related projects in collaboration with industry partners.

6. Launch Industry 4.0 + space innovation bootcamps by hosting short, intensive workshops that introduce workers and students to next-generation production tools with space-specific applications (e.g., in-space assembly, digital twins, mission-grade sensors).

7. Map space sector competency frameworks to existing CTE Pathways to align K-12 and postsecondary career and CTE programs with skills needed in Industry 4.0 and the space economy to promote clear training and employment pipelines.

8. Create an educator resource hub for Industry 4.0 in Space by developing a digital library with teaching modules, space-aligned curriculum toolkits, and industry video content to support instruction.

9. Secure equipment and demonstration sites by identifying facilities and funding needed to acquire training equipment and build demonstration labs that simulate Industry 4.0 environments relevant to space production.

10. Pilot dual-enrollment and apprenticeship programs with a Space focus by partnering with regional employers and school systems to design work-based learning experiences in advanced aerospace manufacturing or satellite testing aligned to Industry 4.0 standards.

STRATEGY 3: BUILD STACKABLE MICRO-CREDENTIALS FOR ADVANCED MANUFACTURING AND QUALITY SYSTEMS.

This strategy focuses on strengthening Maine's advanced manufacturing workforce by collaborating with training providers to close critical skills gaps and develop targeted credentials. These efforts are aimed at supporting existing workers, upskilling new entrants, and recruiting medium to large manufacturers to Maine by ensuring a ready and capable workforce. Tactics include:

1. Develop and deliver specific QMS Modules for Operators and Technicians addressing the 22 Skills needed to address skills gaps, anticipating that each module would result in a mini-certification. The initial training modules for both Operators and Technicians the modules should focus on Fundamentals of Quality Management Systems, Measurement Systems Analysis (MSA), and Statistical Process Control (SPC). For Technicians only, the initial modules should include Failure Modes and Effects Analysis (FMEA), Problem Solving Analysis (PSA), Factory Capacity Modeling (FCM), Production Part Approval Process (PPAP), and Control Plans (CP). The preferred delivery methods should include in-house subject matter expert training and on-line self-paced courses. Presently MCA and MAME are working with USM through a grant to develop micro-credentials for the first 4 QMS modules.

2. Partner with industry and workforce training institutes and organizations to develop stackable micro-credentials that workers can collect to create proficiency tailored to specific job opportunities and upskilling needs

3. Space micro-credentials are bite-sized qualifications demonstrating skills, knowledge and/or experience in a specific subject area or capability.

4. Stimulate more worker supply by offering on-demand learning opportunities for space-curious workers considering joining the space workforce or transitioning to a new position.

STRATEGY 4: DEVELOP AN INTEGRATED TECHNICAL SKILLS PIPELINE.

This strategy focuses on developing a space-aligned technical workforce that supports both new and traditional industries in Maine. By integrating hands-on skills such as welding, machining, electronics assembly, and composites fabrication into a space-ready curriculum, Maine can build a dual-purpose workforce pipeline. Tactics include:

1. Launch an Aerospace Welding and Fabrication Certificate in collaboration with industry and AWS (D17.1 standard).

2. Develop modular training in composites, robotic welding, and orbital welding using mobile or regional labs.

3. Establish clean room fabrication training and contamination control protocols at regional training hubs.

4. Offer non-destructive testing certification pathways (e.g., ASNT Level I/II).

5. Integrate CNC and robotic machining with aerospace quality systems (AS9100, ISO 9001).

6. Expand dual-enrollment and early college opportunities in these trades.

7. Map space-tech competencies to traditional industry hiring frameworks (e.g., shipbuilding).

8. Use the Space R&D Innovation Hub to host co-branded hands-on training programs for space and legacy industries.

STRATEGY 5: SUPPORT STARTUPS AND ENTREPRENEURS THROUGH ACCELERATORS, FUNDING AND MENTORSHIP

This strategy focuses on supporting entrepreneurial entry points into the space economy as a key element of the Maine Space Complex Economic Development Plan. The goal is to enable startups and early-stage companies in Maine to thrive in the space innovation ecosystem by providing targeted training, infrastructure, mentorship, and funding access at all levels. Tactics include:

1. Establish a space entrepreneurship academy as a structured training program for aspiring space entrepreneurs, covering business model development, IP strategy, prototyping, regulatory compliance, and funding pathways.

2. Incorporate space tracks in existing Startup Accelerators by partnering with organizations like Maine Center for Entrepreneurs, Dirigo Labs, and Techstars to add space-specific cohorts or curriculum.

3. Create a space startup grant or micro-investment program to offer early-stage capital (grants or equity-free seed funding) to help space-focused startups move from idea to proof of concept.

4. Develop technical bootcamps and maker-to-market programs to support hands-on product development training for entrepreneurs in advanced manufacturing, electronics, propulsion, sensors, or space software.

5. Offer a mentorship network of space professionals by building a mentor pool of industry experts, NASA alumni, investors, and academic advisors to support startup growth through structured guidance.

6. Host an annual Maine Space startup showcase to highlight emerging companies to investors, partners, and agencies; promote visibility and capital connections.

7. Provide startup space at the Maine Space Complex by subsidizing workspace, shared tools, and testing access to space startups at Brunswick Landing and other regional nodes.

8. Promote Federal opportunities for Space startups by educating entrepreneurs about NASA SBIR/STTR, NSF Convergence Accelerator, AFWERX, and other federal innovation programs.

9. Support student-to-startup pathways by creating fellowships and entrepreneurial internships that place students in space startups or allow them to launch their own ventures.

10. Foster commercialization of University research by working with university tech transfer offices to support spinouts and licensing of space-relevant research into Maine startups.

CREDITS

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