

# Maine Space Complex:

## Space Innovation Hub Implementation Plan

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**Definitions**

Term	Definition

DRAFT

# 1 Introduction

## Document Structure

The following business unit description and implementation plan is meant to inform and instruct future activities of the Maine Space Corporation regarding the envisioned Innovation Hub as a piece of the Maine Space Complex. The document seeks to align the Innovation Hub with the Mission and Vision of the Maine Space Corporation, Legislative Statute, and the State of Maine’s Economic Development Strategy 2020-2029<sup>1</sup>. It further explains how it will fulfill its contribution to these aligning initiatives. The strategic **Goals** are met in part by fulfilling strategic **Objectives**. These **Objectives** are carried out by the **Operations** of the envisioned Innovation Hub, which the **Physical Infrastructure and Capabilities**, **Distributed Infrastructure and Partner Capabilities**, and **Organizational Responsibilities** all support and enable. These **Core Functions** are integral to the **Revenue Streams** derived from the Innovation Hub by the Maine Space Corporation. The document goes on to provide a plan for the successful Phased Implementation of Core Functions and Enabling Infrastructure of the Innovation Hub, in order to meet its goals and produce outcomes that are impactful and attainable for the Maine Space Corporation.

### 1.1 Maine Space Corporation Mission and Vision

**Mission:** “The mission of the Maine Space Corporation is to provide faculty, teachers, students, businesses, partners, and entrepreneurs from within and outside of the state access to a plug-and-play infrastructure where innovations, ground-breaking research and development, problem-solving, spacecraft launch, world-class space data, and analytics capability, and dreaming big are routine occurrences and from which virtual learning is available to teachers, students, and others.”

**Vision:** “By 2030, Maine will be an integral player in the emerging global network of suborbital and orbital transportation to space, providing a significant return on investment as an engine of economic growth and workforce development to the state and the region.”

### 1.2 Legislative Mandate for the Innovation Hub

*“The Maine New Space Innovation Hub, which must 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 research and development, academic and scientific inquiry and a kindergarten to grade 12 learning center and must be designed to attract both in-state and out-of-state interests.”<sup>2</sup>*

## 2 Innovation Hub Mission, Vision, Goals and Objectives

**Mission:** “At the Innovation Hub, our mission is to facilitate the exploration and utilization of outer space for the betterment of humanity while facilitating the sustainable development of Maine’s local economy. We strive to advance space technology and foster space related innovation, foster collaboration, contribute to the commercialization of space and inspire the next generation of space enthusiasts and workforce. Through cutting-edge research and development, a thriving local space knowledge cluster and robust ecosystem, we aim to contribute to the global space community and the

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<sup>1</sup> [Maine Economic Development Strategy 2020-2029](#)

<sup>2</sup> §13203(B), 5 M.R.S.A c.393

local space economy to advance the peaceful, sustainable and responsible exploration of the cosmos while creating economic stability and high-quality opportunity to retain talent locally.”

**Vision:** “The Maine Space Innovation Hub is a leader in space technology and innovations related to its core areas of competence, advancing the development of off-planet economy and harnessing space for the betterment of humanity in a responsible, efficient, and sustainable way.”

The Hub is part of the vertically integrated Maine Space Complex which designed to accelerate the rate of knowledge acquisition and dissemination across the space value chain by shortening time between R&D testing, SSO/LEO launch and downlink that will ultimately increase speed-to-market by offering all these services within state. Over time the depth and speed of knowledge transfer will become a primary benefit to attract more companies that stand to benefit from this interaction and the Complex’s ease-of-use design.

## 2.1 Goals

The Ultimate Goal of the Maine Space Corporation’s Innovation Hub is to grow the New Space Ecosystem in Maine into a nationally-competitive industry knowledge cluster with a focus on environmentally-sustainable practices by attracting and supporting businesses at all stages of maturity - startups, SMEs, and mature corporations - from across the region, US and world.

The following goals support the pursuit of the Innovation Hub’s ultimate goal:

- **Goal 1:** Stimulate + facilitate incremental and disruptive R&D and Intellectual Property across the space value chain, from design to downlink including hardware and software, products and services.
- **Goal 2:** Support new space business creation and existing space business growth.
- **Goal 3:** Foster educational opportunities for Maine’s K-PhD educational pipeline in Space.
- **Goal 4:** Become a global model for incorporating environmentally-sustainable practices into all aspects of the space industry value chain.

## 2.2 Objectives

The following **Table A** lists objectives as they relate to the goals of the Innovation Hub.

**Table A: Innovation Hub Goals and Objectives**

Goals	Objectives	Measuring Success
<b>Goal 1: Stimulate + facilitate incremental and disruptive R&amp;D and Intellectual Property across the space value chain, from design to downlink including hardware and software, products and services.</b>	<b>1.1:</b> Raise capital to build a state-of-the-art Innovation Hub for the Maine Space Complex. Invest in and maintain space-related R&D testing and manufacturing equipment suitable to support core functions of the Innovation Hub.	Measurable funds are those invested in the Maine Space Innovation Hub capital infrastructure through grants, revenues, etc. where appropriate.
	<b>1.2:</b> Establish a Consortium of stakeholders who are members of the Maine Space Corporation to prioritize and drive research, commercial and education projects critical to the State using the foundation elements of the Space Innovation Hub.	Success measured by the number of projects undertaken by consortium working groups and their aggregate benefit.
	<b>1.3:</b> Spur \$2.5 million in R&D-related spending on space industry technologies and initiatives by 2026, then \$10 million annually by 2030.	Measurable funds are those invested in projects spurred by the Innovation Hub, as they relate to consortium and

		stakeholder research groups, activities, etc. to conduct R&D related activities.
	<b>1.4:</b> Collaborate with the University of Maine System, the Roux Institute and the Maine Technology Institute to facilitate and engage in technology transfer partnerships and generate intellectual property.	Engage in technology transfer-related relationships with all major higher-education institutions by 2025. Facilitate a successful generation of novel intellectual property as a tech transfer partner by 2028.
	<b>1.5:</b> Establish relationships with local, national, and international institutions of higher education and corporate tech transfer offices to facilitate participation in Innovation Hub core functions and to create and expand a local and distributed capacity for Space Technology Testing and Qualification to make the innovation process accessible to space-focused Maine entrepreneurs.	Success measured by number of relationships and depth of those relationships as they relate to the space industry, with diverse representation across the space value chain.
	<b>1.6:</b> Collaborate with the Maine Department of Economic and Community Development, business development specialists, the Maine Technology Institute and industry associations to attract mid-sized and large mature corporations to conduct off-premises corporate innovation that benefits from knowledge cluster, shared equipment, and services.	Success measured by number of attracted mid-sized and large mature corporations to conduct off-premises corporate innovation that benefits from knowledge cluster, shared equipment, and services.
<b>Goal 2: Support new space business creation and existing space business growth.</b>	<b>2.1:</b> Working with the Midcoast Regional Redevelopment Authority (MRRRA), Loring Development Authority (LDA), the Maine Center for Entrepreneurs, and the Roux Institute, leverage and/or build upon existing infrastructure and capabilities to operate a space business accelerator/incubator, hosting a select number of space focused startups and small business participants each year recruited from within and outside of Maine.	Success measured by improvements in existing infrastructure and capabilities; and number of startups and businesses that use the facilities.
	<b>2.2:</b> Secure and engage Anchor Tenants in innovative projects that utilize the foundational elements of the Maine Space Innovation Hub.	Success measured by number of anchor tenants that sign agreements.
<b>Goal 3: Foster educational opportunities for Maine’s K-PhD and continuing educational pipeline in Space.</b>	<b>3.1:</b> Annual presentation/seminar at the Maine Space Conference to a new target industry/use case.	At least one presentation per year organized by the Innovation Hub, with the underlying objective being to introduce new industries/use cases to the concept of using space data to solve problems and add value, or to engage educational partners in an exploration of space data to benefit students or educators.
	<b>3.2:</b> Contribute to the Maine Economic Strategic Plan’s vision of creating a credentialed workforce by exploring and delivering certifications and/or microcredentials to bolster Maine’s workforce in topics relevant to the space industry.	Measured by the number of individuals who experience an elevation in their career credentials through the Maine Space Corporation’s workforce development efforts.
	<b>3.3:</b> Encourage and enable creative new ways for Maine’s students to experience STEM and Space curriculum across grades K through 12.	Maximizing number of students engaged in space-focused curriculum.
	<b>3.4:</b> Stimulate pathways between undergrad and graduate education and the new space workforce to strengthen demand for aerospace-related curriculum programs.	Measured by job placement directly after earning a degree as well as number of degree programs offered relevant to the new space industry.

<b>Goal 4: Become a global model for incorporating environmentally-sustainable practices into all aspects of the space industry value chain.</b>	<b>4.1:</b> Prioritize the tenancy and development of environmentally-sustainable companies and technologies.	TBD
	<b>4.2:</b> Work with stakeholders in-state and out-of-state to spur research in sustainable space products and technologies at the Innovation Hub.	TBD

### 3 Innovation Hub Operations

#### 3.1 Design/Engineering/R&D

##### 3.1.1 Design and Research

A mix of startups and established tenant companies will design space-related products and services, and conduct research and development activities. The established companies, for example Teledyne Technologies, will locate some of their operations at the hub to work on both new and existing product lines in an innovative and dynamic environment.

The participation of both startup and established companies is critical in curating an innovative environment.

Corporation staff assist tenants and members by connecting them with other members, corporate and academic, who can consult or do research.

##### 3.1.2 Space Testing and Qualification

Facilitation and/or delivery of end-to-end testing and qualification services for terrestrial systems and products to operate in a space environment safely and predictably is a core function of the innovation hub. The envisioned primary intent of the Space Testing and Qualification function is to serve as an access point to specialized test equipment to test and qualify hardware for launch and in-space environments. The Innovation Hub, working with a distributed network of partners to provide end-to-end services, should seek to form intellectual property and tech transfer agreements with technology stakeholders, and maximize impact of research and development of space technologies that can then be commercialized.

Examples of envisioned services provided both by the Innovation Center and its Distributed Network of Partners:

ISO Standards for sensors/space systems

- ISO 15864: general requirements for space systems
- ISO 14620 (-1,-2,-3): Safety standards for space systems
- ISO16290: Space Environment standards

### 3.1.3 Facilitating Access to Launch

Given the coordination across business units, the Maine Space Complex will facilitate launch for Innovation Hub tenants, thereby shortening distance and time to testing, shortening iterative feedback cycles, and enhancing speed-to-market.

### 3.1.4 Commercialization

The Innovation Hub will support companies through commercialization and revenue creation stages of development.

## 3.2 Manufacturing

In some cases, manufacturing across product categories including componentry, subsystems and systems, instrumentation, satellites, launch vehicles, space transportation, ground equipment etc. will be an activity conducted by tenants in the Innovation Hub.

## 3.3 Contract Testing

Companies that aren't located at the Innovation Hub also need testing. The Corporation will perform testing as a contracted service. This will both bring in revenue and increase the visibility of the Hub outside of the state. Contract testing will require coordination with institution(s) capable of providing or overseeing the services.

## 3.4 Stakeholder Collaboration and Facilitation

The Innovation Hub serves as one of three central venues to be utilized by a consortium network to facilitate innovative activities.

### Consortium Activities

*Standard Legal agreements to Enable Collaboration* - The Maine Space Complex plans to leverage existing work done by the University Industry Demonstration Partnership (UIDP), which provides a framework for facilitating agreements in the realm of technology transfer and research conducted by multiple parties. A standard agreement may need to be tailored for specific cases, and companies will have questions about the agreements. The Maine Space Corporation will seek collaborative partnerships with legal counsel to assist consortium members with these bespoke arrangements as a service to consortium members.

*Working groups to fund common research* - In many instances, a research topic or question will be of interest to multiple companies. The Innovation Hub will facilitate the creation of working groups to study such topics. The Centre for Energy Advancement through Technological Innovation (CEATI), a Canadian industry group for electric utilities, provides a good analogous case for the Maine Space Corporation's vision of having a consortium that forms working groups to pursue common research.<sup>3</sup>

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<sup>3</sup> An example case study involves a working group's pursuit of solving the problem of intermittency that occurs with increased amounts of solar and wind power (these energy generation sources are less continuous and subject to periodic stopping). Hydroelectric plants are capable of providing load balancing but were not designed for such intermittent operation. Research was needed into the effects of frequent start-stops on equipment lifespan and maintenance requirements. CEATI's Hydropower Working Group members paid for this research and have access to

*Input groups for the future development of the Maine Space Innovation Hub* - The Innovation Hub will seek the input primarily of its consortium members and directly affiliated stakeholders to inform high-level direction and strategic planning on a regular and formal basis. This input and subsequent tailoring of the infrastructure to the input serves as another service from the Maine Space Corporation to its members.

### 3.5 Business and Industry Ecosystem Development

Through the Innovation Hub, the Corporation will contribute to efforts to attract space businesses and grow Maine's New Space Ecosystem.

#### 3.5.1 Business Development Activities

Existing Maine businesses to be considered top candidates for recruitment and placement within the Innovation Hub as tenants would be those in stages such as operating from a founder's home, those looking to expand or gain access to Innovation Hub offerings, or those seeking to gain access to the workforce in the Greater Brunswick area. There will not be a focus placed on attracting businesses who are already satisfied in their current location in other areas of the state.

Maine's quality of life is a large selling point to attract out-of-state businesses, particularly those located in expensive, urbanized areas, which could be considered a contrast to much of Maine. Leading with quality of life, the promise to join a nationally-competitive space knowledge cluster, the offerings that the Maine Space Complex can provide, among other things to be determined by the strategy of the Business Development operations of the Maine Space Corporation are seen as strengths to these efforts.

The major categories of businesses considered 'targets' by the Maine Space Corporation's Business Development team include but are not limited to:

- Existing Maine Businesses
- Early-Stage Out-of-State Businesses
- Mature Out-of-State Businesses
- New Businesses by Mainers
- International Space Businesses seeking a presence in the United States Market

#### 3.5.2 Space Business Incubator/Accelerator

The Innovation Hub will host programming specific to fostering new and innovative companies. Critically important to the success of these companies is addressing the period in a company's development where they seek to move from research and development stage to commercialization. Incubation and Acceleration activities differ in that incubation activities include providing environments and resources to help companies succeed, whereas acceleration activities focus primarily on accessing funding and exposure to the commercial communities.

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the results. CEATI, working with outside contractors and organizations, performed the research. The Maine Space Corporation, in conjunction with its consortium members and institutions, could provide a similar model as a service to consortium members.

## 3.6 Virtual Offerings and Services

### 3.6.1 Access to Maine's Entrepreneurial Ecosystem

Connect tenants/members with faculty at the University of Maine System and the Roux Institute at Northeastern University, and with the Maine Technology Institute (MTI), the Maine Center for Entrepreneurs (MCE), the Maine Manufacturing Extension Partnership (Maine MEP), the Maine International Trade Center (MITC), the Maine Procurement Assistance Centers (PTAC), the Small Business Administration SCORE, the UMaine Advanced Manufacturing Center, and the University of Southern Maine's Composites Engineering Research Laboratory (CERL), among others. Many of these organizations have a presence on Brunswick Landing.

### 3.6.2 Investment Community Engagement

The Maine Space Corporation will seek to establish relationships and pathways to the global investment community, particularly those with a focus on bridging the gap between research and development and commercialization phases in a company's development.

### 3.6.3 Programming + Risk Capital Networking

Regular networking events to maintain engagement will be planned by the Maine Space Corporation. There are several venues on-campus at Brunswick Landing capable of hosting networking events. These events, combined with on-premise space developed to hold product and service demonstrations, will be central to the Maine Space Corporation's strategy of sparking innovation and engaging a diverse group of contributors to the cluster.

### 3.6.4 Procurement Assistance

One difficulty experienced by start-ups during design and manufacturing is the sourcing of products and services. The Corporation will work with the Procurement Technical Assistance Center and satellite offices through Maine, the Manufacturers Association of Maine, and the Maine Composites Alliance, among other stakeholders, to ensure procurement assistant services are offered to members who have sourcing needs.

## 4 Innovation Hub Physical Infrastructure and Capabilities

### 4.1 Leased Space

The Innovation Hub Center is envisioned to be co-located with the Data and Analytics Center to leverage innovative opportunities and collaborations and minimize redundant infrastructure. This space includes offices, manufacturing space, meeting space, and educational training and product demonstration spaces.

#### 4.1.1 Manufacturing Space

Tenants to lease private or shared manufacturing facility space. Manufacturing uses require unique features and specifications, including electrical capacity, safety considerations, etc.

#### 4.1.2 Office Space

Tenants to lease private offices. For earlier stage startups, a business suite where companies could rent desk space could be contemplated.

#### 4.1.3 Meeting Space

Conference room space will be available to tenants and consortium members on a sign-up basis, and non-tenants for rental fees or other considerations.

#### 4.1.4 Educational Training and Demonstration Space

Classroom and lecture space will be available for engaging educational consortium in all aspects of space innovation and workforce development, as well as data visualization.

### 4.2 Maine Space Product Testing and Qualification Center

The onsite Maine Space Product Testing and Qualification Center is envisioned to be comprised of equipment and capabilities both on site at the Maine Space Innovation Hub, but also in conjunction with external partners and stakeholders over a distributed network.

#### 4.2.1 Facilities and Equipment

ISO 5 (Class 100) and ISO 7 (Class 1000) cleanrooms are needed for satellite sensors and some components, such as optical. Other components, such as structures and communications satellites, have less stringent requirements. Specific processes and procedures must be adhered to.

#### 4.2.2 Test Equipment

Additional facilities that will be required in the long-term include but are not limited to:

- Thermal vacuum chamber
- Thermal cycle
- Vibration testing
- Electromagnetic interference (EMI) testing
- Faraday
- Anechoic
- Radiation hardening (may involve collaboration with specialized national scale facilities)
- Mass properties
- ESD-safe Detector assembly workstations
- Securable areas for sensitive or classified hardware
- Segregated Engineering Development and Flight Production Facilities
- Film Thickness Measurement System (optical and stylus)
- X-Ray Fluorescence System
- Leak Detectors
- Vacuum Bake-out Chambers

### 4.2.3 Software

The innovation hub could include software with capabilities matching those in **Table B** below:

**Table B: Innovation Hub Software**

<b>Manufacturing-Related Software</b>	Solidworks
	SolidEdge
<b>Advanced Analytics Software</b>	ArcGIS/ESRI
	R
	Cognos
	Tableau
<b>Cybersecurity Software and Protocols</b>	TBD
<b>Hypersonic Testing Software Packages</b>	TBD
<b>Integration of detectors with focal plane array electronics and verification with processing software</b>	TBD

### 4.3 Distributed Partner Network Infrastructure and Capabilities Across the State

The Innovation Hub does not intend to duplicate the efforts or capabilities of existing stakeholders and institutions across the state, and instead intends to supplement its planned facilities with these infrastructure and capabilities to maximize their use and better connect actors. **Table C** displays the institutions and infrastructure that have been identified as supplemental or supporting of Innovation Hub activities.

**Table C: Innovation Hub Distributed Partner Network**

<b>University of Maine</b>	Frontier Institute for Research in Sensor Technologies (FIRST) research center
	Wise-NET Lab
	Advanced Structures and Composites Center
	Advanced Research Computing, Security, and Information Management (ARCSIM)
	Advanced Manufacturing Center
	Innovative Media Research and Commercialization Center
<b>University of Southern Maine</b>	Maker Innovation Studio
	Composites Engineering Research Laboratory (CERL)
	GIS Laboratory
<b>Northeastern University – The Roux Institute</b>	Incubator/Accelerator and Founder Residency Programs
	Thermal Physical and Electrical Characterization
	Mechanical Property Characterization
	Prototyping and Manufacturing
<b>Northeastern University – Kostas Research Institute</b>	Industry 4.0
	Materials and Devices
	Structural Testing
	Additive Manufacturing
	Cybersecurity
	Nanomanufacturing
Data Analytics	

<b>Northeastern University – Institute for Experiential AI</b>	The Institute for Experiential AI commands an industry-leading focus in AI applications and use cases, with a massive network reaching into research labs associated with NASA and other Higher Ed institutions.
<b>Brunswick Landing - TechPlace</b>	TechPlace has a machine shop, weld shop, wood shop, 3d printers, composites layup facility, ovens, paint booth. The Innovation hub could provide higher-tier access to TechPlace with keycard-style access.
<b>Loring Commerce Centre</b>	The Innovation Hub is expected to collaborate with Loring Commerce Centre to explore ways to offer Innovation Hub capabilities or supplements located at Loring Commerce Centre.
<b>Eastern Maine Community College</b>	The Welding Test Center located at Eastern Maine Community College in Bangor, ME offers the following services: Full-time independent mechanical testing laboratory for over 20 years. Specializing in Welding Procedure Specification (WPS) development, Welding Procedure Qualification (PQR) testing and Welder Performance Qualification (WPQ) testing. Fully accredited by the American Welding Society (QC4 Standard for AWS Accreditation of Facilities for AWS Certified Welder Program) to offer the AWS National Welder Certification Tests.

## 5 Corporation Operational Responsibilities

The corporation is developing a corporate administrative structure to include at minimum a director-level role within the Innovation Hub

This position would be tasked with the responsibilities listed in **Table D** below.

**Table D: Innovation Hub Responsibilities**

<b>Property Management</b>	Property Maintenance
	Cleaning
	Equipment Maintenance and Repair
<b>Program Administration</b>	Leasing
	Membership
	Procurement Assistance
	Newsletter
	Equipment Scheduling
	Coordinating equipment and facilities training
	Organizing Tours and Networking Events
	Budgeting and Reporting
	Project Management <ul style="list-style-type: none"> <li>• Working Group Research Updates</li> <li>• Standard Legal Agreements</li> <li>• Technology Transfer</li> </ul>
	<b>Strategic Operations: Operations to grow and improve the Space Data and Analytics Center</b>
Soliciting sponsorships	
Business development	
Attending trade shows	
Grant applications	
Data management	

## 6 Revenue Streams

The Maine Space Corporation seeks to generate revenue to be a sustainable business model. It will rely on multiple streams of revenue to accomplish the goal of operational independence, as displayed in **Table E** below.

**Table E: Innovation Hub Revenue Streams**

Revenue Source	Description
<b>Consortium Membership</b>	An important revenue stream that will be included in the overall corporate plan is fees generated from a membership structure as authorized by the enabling law. Membership will include industry, non-profits, government agencies, universities, all eligible. Emphasis on industry voice. Provides subject matter direction to administrators of the facility to inform needs. The benefits of membership include but not limited to (a) access to networking events, industry communications, consulting services; (b) fee-for-use access to physical plant; and (c) discounts on conferences, events, and access to space and equipment. The income from the fees will support all business units of the Corporation.
<b>Tenancy</b>	Revenues are intended to be collected from tenants, whose rent constitutes their membership into the Maine Space Corporation’s Consortium. The Technical Appendix offers guidance on particular services offered at TechPlace, to give an understanding of what could be provided to Innovation Hub tenants.
<b>Fee for Use</b>	Tenants and non-tenant members will be charged at a differential rate specific to the economics of the equipment and market rate of use.
<b>Fee for Services</b>	Corporation employees can use the physical plant to conduct activities such as testing, analysis, consulting, etc. that could be available to members and non-members at a differential rate.
<b>Sponsorships</b>	Working with companies to secure software licenses, hardware, cash, etc. through legal experts and predetermined agreements to facilitate tech transfer from members of Maine Space Complex Education Consortium.
<b>Training</b>	On-site or “to their door” workforce training for tenants related to initiatives prioritized or based on determined need in collaboration with local community college system and members of education consortium.
<b>Contract Documents</b>	Members and non-members could purchase contract documents or bespoke contract services at a differential rate.
<b>Grant Funding</b>	Innovation hub is positioned to apply for grants to enable further growth, expansion, specific programming. Grants could be sought to fulfill projects for the following activities: Expanding the Physical and Operational Capabilities of the Innovation Hub, Conducting R&D Activities, Supporting Research and Activities to Engage Maine Industries and Stakeholders.
<b>Profit-Sharing Agreements for Tech Transfer and IP development</b>	To be contemplated further with additional stakeholders.

## 7 Implementation Schedule

The following implementation schedule is broken down into three phases – Phase 0 is a planning phase between March 1, 2024 and September 30, 2024. Phase 1, between October 1, 2024 and September 30, 2027 represents Operational Implementation, standing up the minimum viable product of the Innovation Hub. Phase 2, October 1, 2027 and beyond, represents a more-permanent end-state with incremental improvements and changes.

**Table F** below outlines the tasks in Phase 0 that will set the stage for the Innovation Hub leading to specific action items to achieve the operational (**Table G**) and physical & virtual infrastructure (**Table H**) outcomes of each of the implementation phases.

**Table F: Phase 0 Planning Tasks**

<b>Task 1</b>	Determine size-class of componentry/specifications of hardware that enable on-site and distributed network to fulfill end-to-end capabilities needed for successful minimum viable operation of a Maine Space Product Testing and Qualification Center and Innovation Hub broadly.
<b>Task 2</b>	Secure funding under EDA grant application to seed the equipment and facilities necessary for Teledyne E2V to locate a staff member to the Innovation Hub to begin conducting R&D and utilizing the Maine Space Testing and Qualification Center.
<b>Task 3</b>	Secure Memorandums of Understanding and relationships with Institutions that fit within the end-to-end services of Testing and Evaluating Componentry for space applications, including organizations like UIDP for technology transfer best practices.
<b>Task 4</b>	Develop relationships with additional stakeholders and institutions in the Northeast region to identify additional uses of the Maine Space Testing and Qualification Center.
<b>Task 5</b>	Recruit foundational members of the Maine Space Corporation Member Consortium within the Innovation Hub network.
<b>Task 6</b>	Collaborate with stakeholders and partners to develop an implementable system for delivering workforce development learning modules and credentialing.

**Table G: Snapshot of Operational Outcomes/Hub Capabilities**

	<b>Phase 0 (March 1, 2024 – September 30, 2024)</b>	<b>Phase 1 (October 1, 2024 – September 30, 2027)</b>	<b>Phase 2 (October 1, 2027 and beyond)</b>
<b>Design, Engineering, R&amp;D</b>	The Maine Space Corporation will conduct planning activities with the eventual goal of facilitating end-to-end testing capabilities for the testing and qualification of space hardware. At the end of phase 0 there would be a complete dependance on existing infrastructure housed at other institutions within the Distributed Partner Network.	Equipment utilized to pursue space qualification of target products to be determined on-site.	Equipment utilized to pursue space qualification of target products to be determined on-site.

<b>Manufacturing</b>	Manufacturing activities facilitated by the Maine Space Corporation in Phase 0 would be limited to business development activities to attempt to attract manufacturing companies to lease manufacturing space or utilize equipment in the Innovation Hub facilities and TechPlace. Identifying low hanging fruit to design Phase 1 facilities to enable additional manufacturing considerations could be explored in planning activities.	Potential manufacturing use of the hub at this stage depending on mix of tenancy.	Potential manufacturing use of the hub at this stage depending on mix of tenancy.
<b>Contract Testing</b>	The Corporation, relying on its distributed network of partners, to provide, or at least facilitate the project management of, end-to-end contract testing services for space hardware qualification.	Potential depending on depth of staff and on-site equipment capabilities.	Potential depending on depth of staff and on-site equipment capabilities.
<b>Stakeholder Collaboration and Facilitation</b>	Administrative opportunity-seeking and business development representative help to drive and organize stakeholders and potential members of the Maine Space Corporation’s Member Consortium to collaborate on space-focused projects.	Consortium active and pursuing research and development goals.	Consortium active and pursuing research and development goals.
<b>Workforce Development</b>	Working with training partners, the Maine Space Corporation will explore continuing education programs that do not require extensive equipment or resources through prioritized and identified skills training workshops, certification sessions, online platforms, in collaboration with higher education institutions, CTE schools, K-12 schools, and other training and industry development organizations and stakeholders.	Working with training partners, the Maine Space Corporation will provide continuing education programs that do not require extensive equipment or resources through prioritized and identified skills training workshops, certification sessions, online platforms, in collaboration with higher education institutions, CTE schools, K-12 schools, and other training and industry development organizations and stakeholders.  In addition to continuing education programs, implementation of workforce development strategies	Working with training partners, the Maine Space Corporation will provide continuing education programs that do not require extensive equipment or resources through prioritized and identified skills training workshops, certification sessions, online platforms, in collaboration with higher education institutions, CTE schools, K-12 schools, and other training and industry development organizations and stakeholders.

		developed by the Corporation’s Workforce Development Committee in collaboration with higher education institutions, industries, k-12 institution and CTEs will take shape;	In addition to continuing education programs, implementation of workforce development strategies developed by the Corporation’s Workforce Development Committee in collaboration with higher education institutions, industries, k-12 institution and CTEs will take shape;
<b>Business and Industry Ecosystem Development</b>	Business Development Representatives, either contracted or hired, to attract strategic mix of tenants to the Maine Space Complex.	Business Development efforts to attract anchor tenants and other tenants to the Maine Space Complex.	Business development efforts continue to attract businesses to the Maine Space Complex.
<b>Virtual Offerings and Services</b>	Planning stage to lay groundwork for virtual offerings and services.	Administrative staff to connect and socialize members and tenants with organizations like MTI, MEP, MITC, PTAC, SCORE, CERL, etc. where opportunities arrive. Networking events held and miscellaneous stakeholder engagement meetings will occur. Administrative staff in the position to establish system and assist with procurement of componentry, goods, and services.	Administrative staff to connect and socialize members and tenants with organizations like MTI, MEP, MITC, PTAC, SCORE, CERL, etc. where opportunities arrive. Networking events held and miscellaneous stakeholder engagement meetings will occur. Administrative staff in the position to establish system and assist with procurement of componentry, goods, and services.

**Table H: Snapshot of Physical and Virtual Infrastructure Outcomes**

	<b>Phase 0 (March 1, 2024 – September 30, 2024)</b>	<b>Phase 1 (October 1, 2024 – September 30, 2027)</b>	<b>Phase 2 (October 1, 2027 and beyond)</b>
<b>Office Space</b>	Planning phase to understand how best to offer office space to tenants.	The Maine Space Corporation has office space at this stage, and there is office space available for tenants to rent.	Full suite of offices available for rent.
<b>Manufacturing Space</b>	Existing space conducive to manufacturing use to serve as available manufacturing space for potential tenants.	Space dedicated to manufacturing of space products within the Innovation Hub.	Manufacturing space available for rent in a planned standalone Innovation Hub building.
<b>Meeting Space</b>	The conference rooms at TechPlace can serve as primary conference room	The conference rooms at TechPlace can serve as primary conference room space, with	Meeting space exists for tenants and consortium members to use.

	space, with some additional space in the existing Maine Space Corporation headquarters.	some additional space in the existing Maine Space Corporation headquarters.	
<b>Educational Training and Product Demonstration Space</b>	Educational Demonstrations can be conducted in conference rooms in TechPlace, as well as within existing Maine Space Corporation office facilities. Planning efforts to determine specifics for Phase 1.	Educational Demonstrations can be conducted in conference rooms in TechPlace, as well as within existing Maine Space Corporation office facilities, Loring Commerce Centre and other locations throughout the state.	Fully fleshed out educational training and product demonstration space available.
<b>Maine Space Product Testing and Qualification Facility</b>	From a functional perspective, the end-to-end needs of the space industry in testing and evaluating a component for space rating during Phase 0 of the Innovation Hub will rely heavily on existing capabilities at the University of Maine, University of Southern Maine, Northeastern University, and other stakeholders to deliver the necessary services to navigate Space Testing and Qualification of componentry.	Testing and Qualification functioning as minimum viable product in Phase 1.  Modular cleanroom is an option in Phase 1.	Maine Space Product Testing and Qualification facility is completely capable of serving its end-to-end purpose.
<b>Software</b>	Full software needs determined by planning efforts.	Software procured in phase 1 to meet needs of the innovation hub.	Software remains from phase 1, with regular updates and regular review for other needed software.

## 8 Cost Schedule

The following **Table I** is a breakdown of Operational and Capital Expenditures for Phase 1. Operational costs are assumed to be recurring yearly, capital expenditures are considered as one-time expenses.

**Table I: Phase 1 Annual and Upfront Cost Schedule**

<b>Operational Expenses</b>	Rental Expense	Space in Hangar 5 (suites 209, 213, and 214) (75% of costs to Innovation Hub) based on \$14,628 per year	\$10,972
	Utility Expense	Triple Net Utilities from Hangar 5 space (75% of costs to Innovation Hub)	\$5,400
	Office Supplies	Miscellaneous	\$10,000
	Personnel Expenses	½ Center Director’s Salary (other half for overseeing the Data Analytic unit)	\$60,000
		Payroll Taxes (assumes 35% benefits)	\$21,000
	Insurance Expense	General Liability	\$25,000

	Legal Expenses	Legal Fees	\$25,000
	Subscriptions and Fees	Software Expenses	\$10,000
	Service Expenses	Equipment Service Expense (Assuming 15% of Innovation equipment cost)	\$34,500
		IT Contractor Expenses	\$12,500
		<b>Total Annual Operating Expenses</b>	<b>\$214,372</b>
<b>Capital Expenses</b>	Furniture and Equipment	Office Tables (3)	\$1,200
		Office Chairs (10)	\$2,500
		ESD Workbenches/Worktops (10)	\$25,000
		ESD High stools/workbench chairs (10)	\$5,000
		Monitors	\$1,000
		Server/Network Equipment	\$500
		Computers and Miscellaneous Needs	\$5,000
		Vibrational Testing Equipment	\$50,000
		Thermal Vacuum Space Simulation Chamber (with Bake-out chamber)	\$100,000
		Thermal Cycle Testing Equipment	\$30,000
		EMI Testing Equipment	\$50,000
		Modular Clean Room (12 x 24 Class 100)	\$50,000
		Renovation: Hangar 5, suites 209, 213, and 214	1,330 square feet @~\$250 per square feet. Minimum renovations to align with EDA non-construction requirements.
			<b>Total One-Time Capital Expenses</b>
		<b>Total Phase 1 Investment</b>	<b>\$934,572</b>