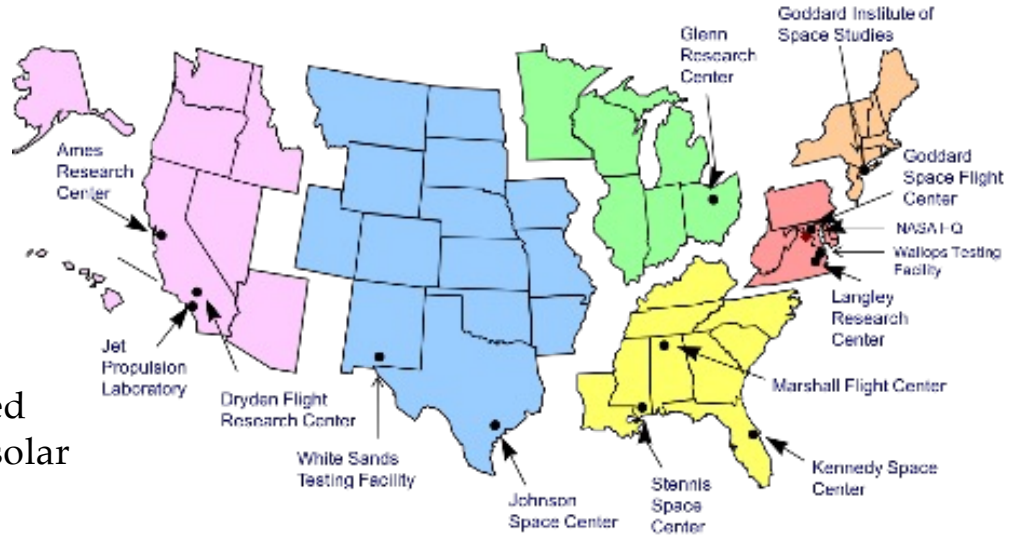

MAINE SPACE GRANT
CONSORTIUM
MAINE
SPACE
2030

NASA Mission Directorates

Aeronautics Research: Enables a safer, more secure, efficient, and environmentally friendly air transportation system.

Exploration Systems Development: defines and manages systems development for programs critical to NASA's Artemis program and planning for NASA's Moon to Mars exploration approach; manages the human exploration system development for lunar orbital, lunar surface, and Mars exploration.



Space Operations: responsible for enabling sustained human exploration missions and operations in our solar system.

Science: Explores the Earth-Sun system, our own solar system, and the universe beyond.

Space Technology: Develops the crosscutting, advanced and pioneering new technologies needed for current and future missions benefitting the aerospace industry and other agencies, and addressing national needs.

National Space Grant College and Fellowship Program

Established by Congress in 1989

National Goal:

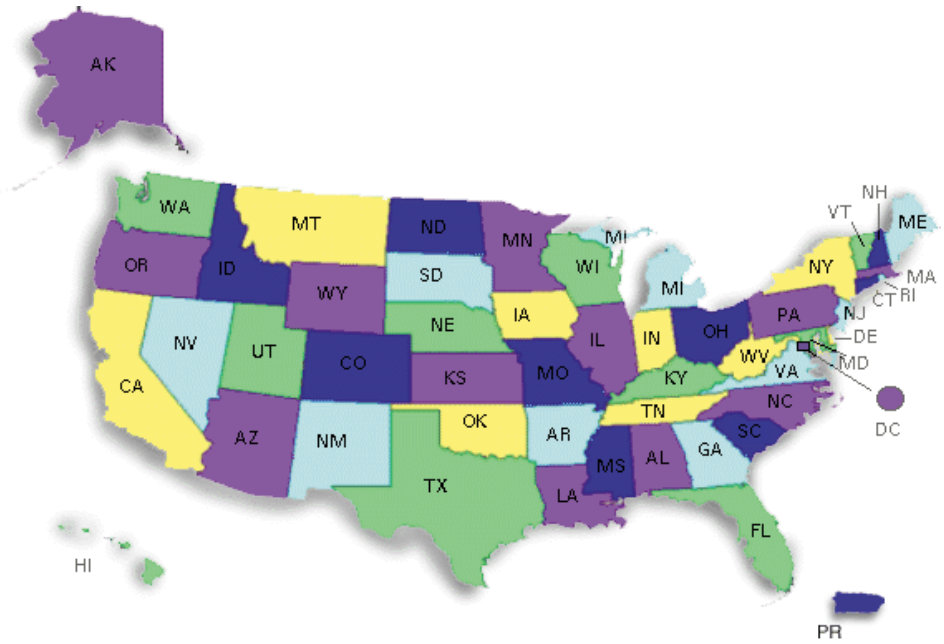
Contribute to the nation's science enterprise by funding education, research and public engagement projects through a national network of university-based Space Grant consortia.

National Objectives:

- Establish and maintain a national network of universities.
- Encourage cooperative programs among universities; aerospace industry; and Federal, state and local governments.
- Encourage interdisciplinary education, research and public service programs related to aerospace.
- Recruit and train U.S. citizens, especially women, underrepresented minorities, and persons with disabilities.
- Promote a strong science, mathematics and technology education base from elementary through secondary levels.

National Network:

The Space Grant national network includes over 850 affiliates from universities, colleges, industry, museums, science centers, and state and local agencies. These affiliates belong to one of 52 consortia in all 50 states, the District of Columbia and the Commonwealth of Puerto Rico.



Maine Space Grant Consortium

- 501(c)(3) corporation
- Member of NASA's Network of National Space Grant College and Fellowship Program in all 50 states plus Washington, DC, and Puerto Rico
- Affiliates

Private 4-Year Institutions
- Bates College
- Bowdoin College
- Colby College
- College of the Atlantic
- University of New England
- Saint Joseph's College of Maine
- Roux Institute

Public 4-Year Institutions
- Maine Maritime Academy
- University of Maine
- University of Southern Maine

Public 2-Year Institutions
- Southern Maine Community College
- York County Community College

Non-Profit Research Institutions
- Gulf of Maine Research Institute
- Bigelow Lab for Ocean Sciences

Non-Profit Educational Institutions
- Maine Math and Science Alliance
- Challenger Learning Center of ME
- ME Mfg Extension Partnership

For-Profit R&D Institutions
- VALT Enterprises, LLC
- Blushift Aerospace
- Lockheed Marti

K-12 Schools
- Me School of Math and Science
- Fryeburg Academy

Board of Directors:
- Karl Hoose, President, VALT Enterprises, Sanford
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- Luke Shorty (Secretary/Treasurer), Thomas College
- Scott Burgess, Science Teacher, John Bapst High School, Bangor
- Nikki Becker, Observing Program Leader, National Weather Service, Gray

- Responsible for Space Grant and NASA EPSCoR
- Since 2001, invested over $25 million in our Affiliates to strengthen the state's aerospace research and education infrastructure by seeding research, internships, fellowships, curriculum development, and K-12 activities.
- Supported research include biomedical science, advanced materials science, high performance propulsion systems; remote sensing applications; marine sciences; climate change; data science and engineering; and sensor technology.

ELIGIBLE RESEARCH AND EDUCATION AREAS

Research and Education Areas

- Biological Sciences
- Medical Sciences
- Marine Sciences
- Computer and Information Science and Engineering
- Engineering
- Geosciences
- Mathematical and Physical Sciences
- Social and Behavioral Sciences
- STEM Education
- Technology, Innovation and Partnerships
- History, Media and Communication

Proposal Topics

- Research to support space exploration and development
- Use of NASA data & technology to address Maine needs.

INTERNSHIPS AND FELLOWSHIPS

- **Undergraduate Research Experiences (UREs).** The goal is to increase participation of undergraduate students in interdisciplinary STEM research broadly defined and align with interests of NASA and Maine. (160 hours, $3,000 per student)

- **Graduate Fellowships.** The goal is to increase participation of graduate students in interdisciplinary STEM research broadly defined and that align with the interests of NASA and Maine. (160 hours, $6,000 per student)

- **Maine Aerospace Workforce Development Program.** The goal is to engage undergraduate students at Affiliate institutions, in summer research experiences at NASA centers and Maine industries. The 10-week (400 hours) internship motivates students to consider NASA-related careers in the public and private sectors. ($7,300 per student)

- **Maine Research Internships for Teachers and Students (MERITS).** The primary goal of MERITS is to inspire highly motivated high school juniors to consider aerospace careers by engaging them in 'real-world' applications of STEM in research-focused work at host institutions engaged in various STEM activities. MERITS supports six-week summer research internships. ($2,200 per student)

SEED RESEARCH FUNDING

- **Ideas Lab** at UMaine. The goal is to engage researchers from higher education institutions, especially primarily undergraduate institutions, and businesses to identify and seed one or more strategic, novel, transformative, multidisciplinary, multi-institutional team-based R&D and/or education projects that align with the priorities of Mission Directorates and the Consortium's topic areas.

- **Innovation Seed Fund (ISF)**. The goal is to seed one or more strategic, novel, transformative, cost-effective, multidisciplinary research and/or education project teams identified in the Ideas Lab that align with the priorities of Mission Directorates and the Consortium's Topic Areas. ($25,000 to $100,000 plus potential support undergraduate and graduate students).

FUNDED SEED RESEARCH PROPOSALS

- **Autonomous UAVs for crop monitoring in the state of Maine (**UMaine and Roux Institute)
- **Bioprinted blueberry plant cells as a multi-use product for long-term space exploration (**UMaine and USM)
- **Aerospace Science and Technology in Secondary Schools (ASTSS) (**UMaine, USM, Bangor High School, and Southern Maine Community College)
- **Decentralized and resource-efficient satellite swarm** (UMaine)
- **AI-Carb: An AI-based high-resolution carbon flux monitoring and simulation platform** (UMaine and Schoodic Institute)
- **Robust lifelong learning to improve the health of aquatic ecosystems** (UMaine and NASA Goddard Space Flight Center)
- **New crops for space exploration** (UMaine)
- **Jumping and landing in extreme conditions: From biological systems to bio-inspired robots** (UMaine)

HIGHER EDUCATION CURRICULUM DEVELOPMENT FUNDING

The goal is to support higher education affiliates in improving their STEM curricula through the development or revision of STEM courses and curriculum and integration of NASA-related education and research contents into the curriculum. Proposals that pilot how modified STEM curricula could be delivered through synchronous or asynchronous modes of instructions are acceptable and encouraged.

- **Course/curriculum development**: A maximum of $10,000 will be awarded to each winning proposal. Cost share is required at a 1:1 ratio.
- **Course/curriculum revision:** A maximum $5,000 will be awarded to each winning project. Cost share is required at a 1:1 ratio.

Unallowable costs: Equipment purchases that include single items that are $5,000 or more and has a useful life of more than one year; general purpose equipment such as computers and printers, foreign travel, civil service personnel salaries or travel, facility repairs, renovations or additions.

Indirect (F&A) cost: Rates charged to this program cannot exceed 10%. Indirect cannot be charged to student support, or for workshop participant support. Any unrecovered indirect costs can be used as cost share.

Cost Share: Cost share can be in the form of cash, in-kind support, or a combination of both 1:1 cost share requirement. Fully recoverable F&A rates.

Other Programs

- **Maine Student High Altitude Platform** program at UMaine. The goal is to build institutional capacity for student-based scientific ballooning experiments that build skills, techniques and methodologies applicable throughout the students' STEM careers. UMaine provides launch opportunities for other institutions.

- **CubeSat Launch Program** at USM. The goal is to support student-based (grades 6 to undergraduate) CubeSat projects that build skills, techniques and methodologies applicable to NASA missions and create pathways into advance technical careers. Includes the annual grade 6-12 Cubesat Design Competition.

- **Drifters and CubeSat Development Program** at the Southern Maine Community College as a capacity-building project centered around using ocean Drifters and CubeSat technology to correlate ocean currents with primary productivity.

- **Travel Grants -** The goal is to help researchers from academic, non-profit and business Affiliates, students and K-12 teachers initiate collaborations with NASA researchers or to present at professional conferences. We will consider requests for travel funds on an on-going basis.

K-12 Activities

- **STEM4Me.** A co-funding partnership with the Maine-based Perloff Family Foundation, the goal of STEM4Me is to support a wide range of teacher-initiated projects to encourage students to "think outside the box" create real-world solutions to problems in a variety of STEM areas using NASA content as well as content from other sources. web-based tools such as Facebook, blogs, and video.

- **Space Day Maine.** The goal of Space Day Maine, part of the national annual Space Day Educational Initiative created by Lockheed Martin Corporation in 1997, is to heighten K-12 students' enthusiasm for NASA and STEM as well as inspire them to pursue STEM careers.

- **Teacher Professional Development.** The goal is to immerse cohorts of K-12 teachers from formal and informal learning settings in best practices and methodologies to develop and implement real--world, Project Based Learning curricula in their classrooms using NASA missions.

    - **Space Experiments Professional Development Workshop for Maine K-12 Teachers (Teachers-In-Space, Educate Maine) -** Teachers will learn how to build Arduino-based CubeSats with their students and launch them next spring into space using a Firefly rocket in California.

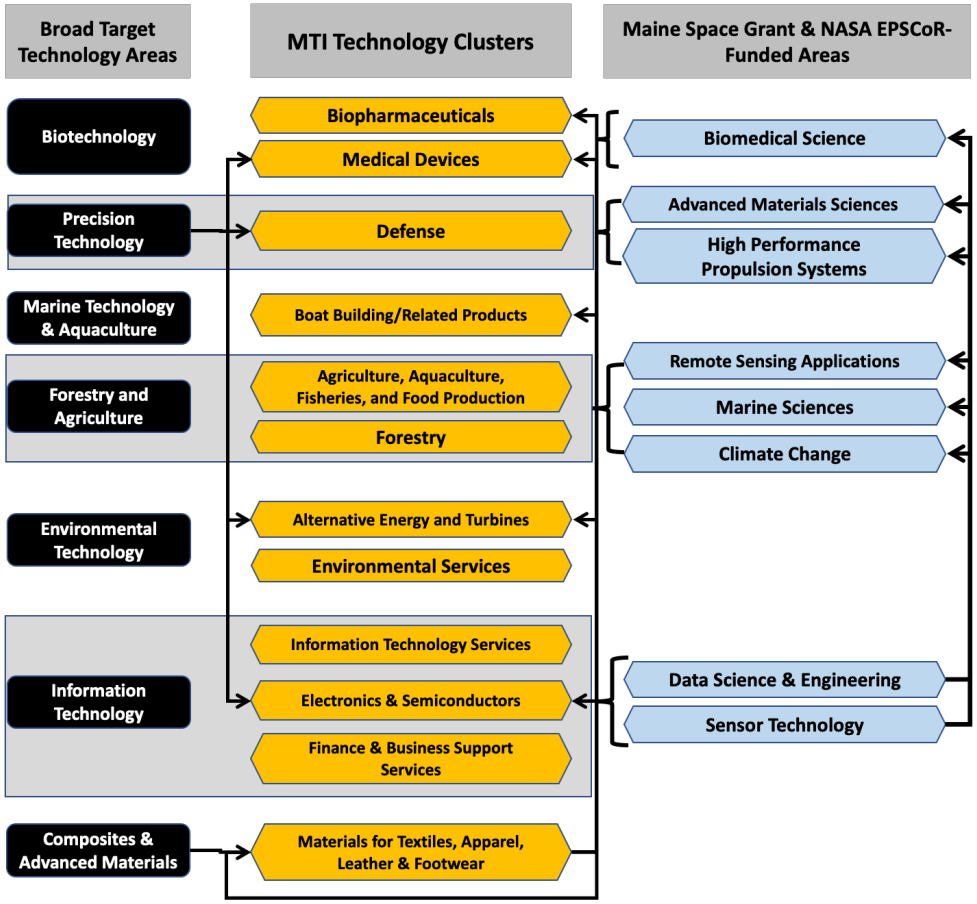
    - **Satellite Chipset Computer Science Learning Module (Educate Maine and *MAX*IQ) -** Introduce students in Washington County to satellite chipset data collection and analysis capabilities to address scientific questions. Students will compete for a ride on the next bluShift Aerospace rocket test launch scheduled for 2023.

NASA EPSCoR Funding

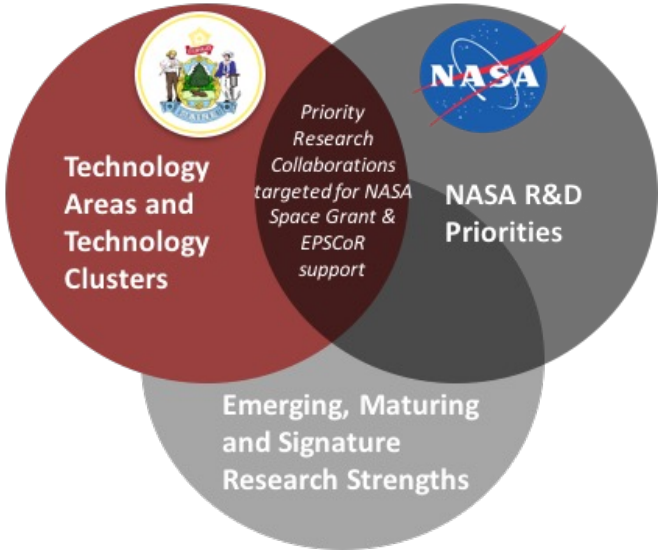
- **Research Infrastructure Development (RID) Program**
  - Collaborative Seed Research Grant (up to three awards @$50,000,)
  - Workshops (up to three awards @$5,000)
  - Travel Grants (up to $2,500 per award, first come basis)
  - 1:1 cost share requirements for seed research and workshop proposals.
  - Indirect (F&A) on seed research proposals is capped at 10%. F&A is not allowable on workshop and travel proposals. Unrecovered F&A is an allowed form of cost sharing.

- **Research Competition:**
  - NASA annual competition administered by MSGC.
  - $750,000 over three years per funded proposal.
  - 50% cost share requirement. Fully recoverable F&A rates
  - Prior to release of official NASA announcement, we release an instate announcement.
  - Eligible applicants are higher education & research institutions and businesses
  - Proposals submitted to MSGC are reviewed by out-of-state “external “reviewers and the Maine NASA EPSCoR Technical Advisory Committee.
  - MSGC submits only one proposal to NASA EPSCoR for review.
  - MSGC is the applicant, the Maine NASA EPSCoR Director is the PI and the faculty member is the Science-I. MSGC issues a subaward to the institution

Research Investments by Area since 2001



Alignment of MSGC Space Grant and NASA EPSCoR Funded Research Areas with the State's Seven Broad Technology Areas and Technology Clusters.



Examples of MSGC Funded Research

University of Maine
- Crew Health Monitoring Using a Novel Neuro-Cognitive Sensor Network
- Wireless Leak Detection and Localization Using Airborne Ultrasonics with Technology Demonstration on the International Space Station
- Behavior and Optimization of Hypersonic Inflatable Atmospheric Decelerator Devices for Spacecraft Re-Entry.
- Multi- and hyperspectral bio-optical identification and tracking of Gulf of Maine water masses and harmful algal bloom habitat
- Visionary Workshop for Understanding and Forecasting the Impact of Climate Change on Maine's Forest.
- Experimental Studies of Biosignatures in Serpentinite-Water Systems.

University of Southern Maine
- Non-contact Method for Studying Impending Failure in Mechanical Systems.
- Stellar Outflows from Oxygen-Rich Stars: Effect of Nucleation Models.
- Effects of radiation on neuronal survival, morphology, and function.

Gulf of Maine Research Institute
- Earth System Data Solutions for Detecting and Adapting to Climate Change in the Gulf of Maine.

Bigelow Laboratory for Ocean Sciences
- Learning How to Breathe: What Can We Learn About Antiquity, Biological Iron Oxidation, and Respiration on Oxygen from Modern Fe-Oxidizing Bacteria.

Colby College
- Using High-Resolution Simulations to Inform Observations of Galaxy Structure in the Early Universe.

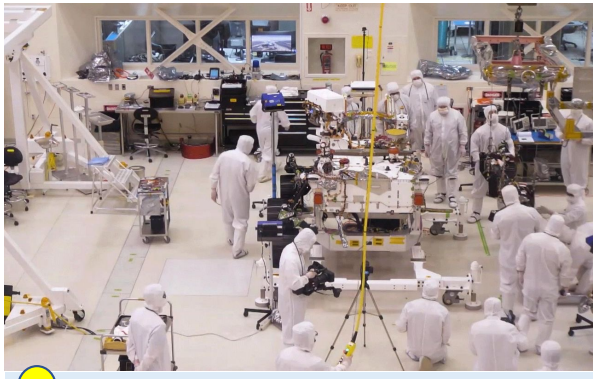
VALT Enterprises, LLC
- Preliminary Flight Demonstration of a Nanosatellite Launch System.

Examples of MSGC Funded Research

Program/Grant Name	Institution	Amount
NASA EPSCoR Research Science-I: Andrew Thomas, Multi- and hyper-spectral bio-optical identification and tracking of Gulf of Maine water masses and harmful algal bloom habitat.	UMaine	$749,635
NASA EPSCoR Research Science-I: Parinaz Rahimzadeh Bajgiran, Multi-scale remote sensing approaches for forest health assessment.	UMaine	$749,635
NASA EPSCoR Research Science-I: Onur Apul, Metastable Oxygen Nanobubbles to Advanced Life Support Systems in Space Exploration	UMaine	$749,635
NASA EPSCoR Rapid Response Research Science-I: Margaret Estapa, Appendix J: Improving Estimates of Land-to-Ocean Carbon Flux Through Characterization of Colloidal Inherent Optical Properties	UMaine	$99,963
NASA EPSCoR Research Infrastructure Development PI: Andrew Neils, Design for Hybrid Additive Manufacturing of Primary Aerospace Structures	Roux institute	$49,987
NASA EPSCoR Research Infrastructure Development PI: Asheesh Lanba, Investigating shape memory alloys for auxetic actuation and high temperature applications	USM	$49,857
NASA EPSCoR Research Infrastructure Development PI: Vinton Valentine, Scoping the development of multi-platform, multispectral imagers for the state of Maine	USM	$50,000
NASA EPSCoR Research Infrastructure Development PI: Jeff Katz, Development of Organic Materials: Synthesis and characterization of Oxacalixarenes and Poly (meta-phenylene oxides)	Colby College	$41,214
NASA EPSCoR Research Infrastructure Development PI: Torsten Hahmann, AI-based knowledge infrastructure for PFAS contamination in Maine	UMaine	$49,996

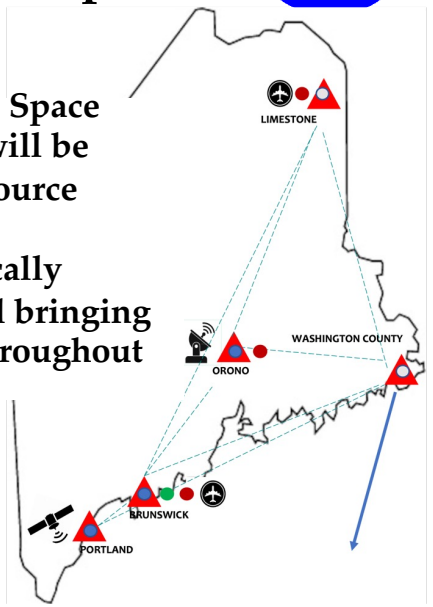
The MAINE SPACE COMPLEX will have three, shared-resource-based, integrated units to engage Maine in the NewSpace

1 The **Space Data & Advanced Analytics Center** will be a cloud-based, digital platform resourced to import/downlink, store, cleanse, manage, and analyze satellite data in concert with terrestrial data to solve local business public policy issues in innovative ways.



2 The **New Space R&D and Innovation Hub,** to be located at Brunswick Landing, with a spoke at Loring Commerce Centre, is envisioned as a knowledge and innovation hub for new business incubation and acceleration, hardware and materials component development facilities, satellite and launch vehicle manufacturing and testing, K-12 activities, and tourism.

The Maine Space Complex will be shared-resource based and geographically distributed bringing benefits throughout the State



3 The **Launch Sites & Services** will include both vertical launch sites at one or more locations along the coast of Maine, as well as horizontal launch capabilities from aircrafts that leverage the long runways at Brunswick Landing and Loring Commerce Centre.

The Complex's business units will generate revenues and focus on upstream manufacturing and downstream data analytics

1 CENTER FOR SPACE DATA & ADVANCED ANALYTICS

Outputs
- Data Products & Services

Use Case Development
- Industry Partner-ships
- Research Programs
- Cyber-security Lab

Analytics
- Intellectual Capital

Compute
- Quan-tum Comp
- Storage & Data Mgmt
- Adv. Analyti cs SW

Space Data Sharing
- Ground Network Node

Data Acquisition
- Ground Station
- Open Source/ Buy

Location
- Brunswick Landing
- Distributed Capabilities

2 SPACE INNOVATION HUB

Capabilities
- Satellite Mfg.
- Constellation Design
- Component & Subsystem Mfg.
- Mission Control
- Cybersecurity
- Ground Stations
- Rocket R&D
- Biopharma
- Orbital Mechanics
- Horizontal Launch
- Adv. Materials

Meeting / Education Space
- Classrooms, Training, Planetarium & Conference Facilities

Offices
- Industry Groups
- MSC admin.
- Risk Capital
- SMEs/ Corporations
- Academic Institutes/ Tech Transfer

Test Facilities
- Spacecraft integration and test facilities

BL/LCC Residents
- Space SME / Startups
- Est. Business
- Academic

Space Research Equipment
- Anechoic Chamber
- Clean Rooms
- Shaker Table
- Faraday Cage
- 3D Printing
- Ground Station/Antennae
- Vacuum Chamber
- Electrical Engineering Lab
- Materials

Location
- Brunswick Landing with a spoke at Loring Commerce Centre

3 LAUNCH SITES AND SERVICES

Satellite Launch from Maine
- Launch Service

Network
- Ground Network

Terminals TTC
- Remote Terminals

Launch Prep
- Payload Integration

Launch Components
- Fuel Storage

Operations Capability
- Command & Control (Brunswick)

Location
- Loring AFB & Coastal Site (TBD)

Research Topic Areas

The Table below identifies R&D topic areas associated with seeding the foundation for the *Maine Space Complex*.

Maine SpacePort Complex Topic Area	Mission Directorate*	NASA Center**
Big Data & Analytics and Data Management	HEOMD	LRC, ARC, GSFC, JPL
Quantum Computing & Storage	HEOMD	GSFC, ARC
Ground Communication	HEOMD	KSC, MSFC, JSC, JPL, GSFC
CubeSat & Constellation Design	STMD	GSFC, ARC, MSFC
Vehicle and payload integration	HEOMD, STMD	KSC
Launch services	HEOMD	KSC, GRC, GSFC, SSC, MSFC, JPL
S&E Payload R&D	HEOMD, STMD, SMD	LRC, JPL, GSFC, ARC
Navigation & Tracking	HEOMD, STMD	GSFC, MSFC, GRC, JPL, MSFC
Geospatial Informatics and remote sensing	STMD	GSFC, JPL, LRC
Communications	HEOMD	JSC, GRC, JPL
Small launch vehicles, components, subsys mfg.	HEOMD, STMD	LRC, KSC, MSFC, GRC, JSC, JPL
Satellite manufacturing	STMD	MSFC, KSC, JPL, LRC
K-12 STEM Capability	All	All

Maine Space 2030

www.mainespace2030.org

A public awareness campaign designed to raise awareness of Maine's research, education, and commercial assets in the NewSpace economy, and attract investments to realize the considerable economic potential for the people and the future of Maine.

Maine Space 2030 has set a goal of 2030 for Maine to 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.

Maine Space 2030 will underscore the work of the newly established Maine Space Corporation and the Maine Space Complex; promote K-12 STEAM; serve as an information hub for space-related R&D in Maine's higher education and not-for-profit research organizations; highlight the state's space-related manufacturing supply chain; and promote opportunities for internships, fellowships and training programs for students and workers

Founding partners include but not limited to the Maine Space Grant Consortium, the Maine Composites Alliance, the University of Maine, the University of Southern Maine, the Maine Community College System, the Roux Institute, Educate Maine, the Manufacturers Association of Maine, the Maine International Trade Center, the Maine Department of Economic and Community Development, the Maine Department of Transportation, SHL Enterprise Solutions, and DesignLab LLC.

Maine Space Conference

www.mainespace2030.org

*Part of the **Maine Space 2030** campaign, will be held November 5-7, 2023, at the Holiday Inn By the Bay in Portland, Maine. The Conference will feature a series of presentations and panel discussions from leaders across Maine and the nation. The Conference will highlight the Maine Space Corporation, the Maine Space Complex, research and development, education, workforce development, and showcase Maine's unique advantages in the NewSpace economy.*

Conference session themes will cover:

- The Future of Space
- The Maine Space Complex
- Space Data Analytics
- Innovation for a New Era
- Maine's Aerospace Industry
- Building Maine's Artemis Generation from K-12 to Businesses

Target audience includes:

- Higher education institutions
- Non-profit research and education organizations
- Maine, national and international businesses
- Investors
- K-12 teachers and students
- Industry associations
- Federal, state and local agencies
- Community members.

● Sponsor Package ● Exhibitor Package ● Call for Contents and Speakers

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