Hawai‘i Aerospace Port Assessment

Feasibility Study and Options Overview

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Disclaimer: *The data gathered to support this Report comes from publicly available sources and initial discussions with Hawai‘i state/federal officials, community leaders, and industry stakeholders.*

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Contents

List of Acronyms

- **HTDC** – Hawai‘i Technology Development Corporation
- **DBEDT** – Department of Business, Economic Development & Tourism (State of Hawai‘i)
- **HSFL** – Hawai‘i Space Flight Laboratory
- **PISCES** – Pacific International Space Center for Exploration Systems
- **FAA** – Federal Aviation Administration
- **AST** – Office of Commercial Space Transportation (FAA)
- **NASA** – National Aeronautics and Space Administration
- **AAM** – Advanced Air Mobility
- **UAM** – Urban Air Mobility
- **UAV** – Unmanned Aerial Vehicle
- **eVTOL** – electric Vertical Takeoff and Landing (aircraft)
- **PMRF** – Pacific Missile Range Facility (Kaua‘i)
- **HAPS** – High-Altitude Pseudo-Satellite (stratospheric drone/balloon)
- **RIMS II** – Regional Input-Output Modeling System (economic multipliers)
- **REMI** – Regional Economic Models, Inc. (economic forecasting system)
- **NEPA** – National Environmental Policy Act (federal environmental review)
- **HEPA** – Hawai‘i Environmental Policy Act (state environmental review, HRS 343)
- **HRS** – Hawai‘i Revised Statutes
- **EA** – Environmental Assessment
- **EIS** – Environmental Impact Statement
- **OHA** – Office of Hawai‘ian Affairs
- **MOU** – Memorandum of Understanding
- **P3** – Public-Private Partnership
- **CSOSA** – Commercial Space Operations Support Agreement (DoD-use agreement)
- **HUBZone** – Historically Underutilized Business Zone (SBA program)
- **UN SDGs** – United Nations Sustainable Development Goals

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Executive Summary

This report assesses the feasibility of developing an Aerospace Port in the Hawai‘ian Islands. Generally, an Aerospace Port is a coordinated set of facilities, services, and procedures that allow vertically and/or horizontally launched aircraft/, spacecraft, and uncrewed systems to be tested, launched, recovered, and supported under applicable federal, state, and local rules. It may be horizontal (air-launch, spaceplanes, AAM/UAV) at existing airports, vertical (orbital/suborbital rockets) at a dedicated off-airport site, or a hybrid combining both. An Aerospace Port could include the following:

- **Modes**: Horizontal operations at existing airports (spacecraft towed or ferried by aircraft to high-altitude for release to launch into orbit); Vertical operations from a dedicated off-airport pad; or a hybrid network across islands.
- **Activities**: Launch, test, and recovery; AAM/UAV operations; research & development; integration/checkout; training; education/outreach.
- **Range services**: Airspace coordination, telemetry/tracking, command & control, safety & emergency response, environmental monitoring.
- **Facilities**: Runways & aprons, hangars, vertiports, integration clean rooms, control rooms, fuel/charging, secure staging and storage.
- **Governance**: Operates under FAA oversight and other authorities; vertical operations proceed only after required environmental and cultural reviews; no vertical launches at airports.

Any vertical launch site would require full environmental and cultural reviews. No vertical launches are proposed at airports. This assessment compares five pathways: horizontal-only, vertical-only, phased hybrid, distributed (“Option X”), and no-build. This report consolidates prior studies, refreshes demand and site analyses, and presents clear options so leaders and communities can weigh trade-offs before any decisions are made. It is informational and non-prescriptive. It does not pick a site, approve a project, or commit resources. It maps potential pathways including phased, start-small approaches. Preliminary costs, revenue models, and economic impacts are derived from operational analogs (Kodiak, Wallops, Spaceport America) and Hawai‘i-specific multipliers (Tauri Group 2023; U.S. Bureau of Economic Analysis 2024).

Market urgency

In the first half of 2025, 169 orbital launch attempts occurred worldwide at approximately one every 26 hours (McDowell 2025). This launch cadence underscores how quickly

access to space is accelerating. FAA forecasts indicate that this pace will only accelerate, with U.S. commercial launches projected to rise from 174–183 in FY2025 to between 259 and 566 annually by FY2034 (FAA 2024). Small satellites are also driving demand: roughly 2,730 CubeSats have been launched to date, with an additional 1,900 nanosatellites expected to launch by 2029 (Nanosats Database 2025; BryceTech 2023). At the same time, the Advanced Air Mobility/Unmanned Aerial Vehicle (AAM/UAV) sector is projected to expand from $11.5 billion in 2024 to $73.5 billion by 2034, reflecting rapid growth in this adjacent aerospace market (Frost & Sullivan 2024).

Financial and cost trends reinforce this momentum. Venture capital investment in the space sector hit record levels in 2024, with 595 deals totaling $8.6 billion—an increase of 75 percent year-over-year (fDi Intelligence 2025; Space Foundation 2025). Meanwhile, the launch costs have dropped dramatically, from roughly $54,500 per kilogram on the Space Shuttle to about $2,720 per kilogram on reusable Falcon 9 vehicles (CSIS 2022). Together, all of these trends point to a booming Aerospace economy.

Geographic potential and existing infrastructure

Hawai‘i’s lower latitude is superior to many mainland sites for horizontal and vertical space launches because its geographic position reduces the velocity needed to reach orbit by ~0.5 km/s for equatorial trajectories (NASA 2022; Space Foundation 2025). The islands also offer unobstructed over-ocean launch corridors for both equatorial and polar trajectories, reducing risk to populated areas regardless of launch mode (PISCES n.d.; Alaska Aerospace & FAA 2019).

Existing assets provide multiple viable starting points:

- Hilo International Airport (ITO) with its 9,800-foot runway, FAA control tower, and adjacent deep-water harbor supports horizontal operations, including UAM/UAV/AAM testing, air-launch rockets, and spaceplane missions (State of Hawai‘i DOT 2025; AirNav 2025).

- The Pacific Missile Range Facility (PMRF) on Kaua‘i offers instrumented over-ocean ranges ideal for horizontal air-launch tracking and vertical rocket telemetry (Sandia National Labs 2024).

- Select private parcels such as Kea‘au near Hilo enable dedicated vertical launch pads with clear hazard zones and minimal overflight risk (PISCES 2019).

Economic potential

Initial investments can be modest relative to peers, for example: ~$3–5M for horizontal operations at an existing airports, scaling to ~$15–25M+ for a dedicated vertical pad (in line with projects at Kodiak, AK, and Midland, TX) (Alaska Aerospace Corp., 2021; Midland Development Corp., 2024). Using Hawai‘i-specific RIMS II multipliers, each $1M in construction supports ~6.5 local jobs (U.S. Bureau of Economic Analysis, 2024). Early steady-state operations for a combined horizontal/vertical port could support ~70–90 direct jobs and ~105–135 indirect jobs, with ~$8–10M in annual wages circulating locally (Tauri Group, 2023; Spaceport America Master Plan, 2025).

Community Trust

Past proposals in Hawai‘i stumbled not for technical or economic reasons, but due to insufficient engagement and community concerns (Civil Beat, 2019; Environment Hawai‘i, 2014). Any path forward must prioritize transparency, cultural respect, environmental stewardship, and tangible local benefits (jobs, education, infrastructure). Speed matters, but only alongside collaboration and trust on Hawai‘i’s terms (NIST, 2020; PISCES, 2019).

Introduction

Contracting Agency and Consultant

This study is undertaken on behalf of the Hawai‘i Technology Development Corporation (HTDC), an agency attached to the State of Hawai‘i DBEDT (Department of Business, Economic Development & Tourism) tasked with driving tech-based economic development. Computer Access Technologies, LLC, serving as the consultant with employees in Maui, has worked closely with state stakeholders to evaluate the feasibility of the development of an Aerospace Port in the State of Hawai‘i. Key contacts aiding in the construction of this report include the University of Hawai‘i’s Space Flight Laboratory (HSFL) and the Pacific International Space Center for Exploration Systems (PISCES), the HTDC, commercial industry representatives, and government representatives, among others reflecting a broad coalition of technical, industry, local, and academic outreach.

Background

Hawai‘i has long recognized the potential for aerospace as a driver of economic diversification, given its strategic location and scientific assets. Multiple studies and proposals since the 1980s have explored establishing space launch capabilities in the state. In 2023, the Hawai‘i State Legislature underscored this interest by considering

Senate Bill 581 (SB581), aiming to create an Aerospace Development Program under DBEDT (LegiScan, 2025). This feasibility assessment updates prior analyses and organizes the existing options and opportunities for developing an Aerospace Port in Hawai‘i. This report synthesizes current market data, site characteristics, and stakeholder input to present a structured menu of options. It does not recommend a single path or final plan. Decisions about whether, where, and how to proceed rest with the State of Hawai‘I and its communities through their established policy and engagement processes.

Purpose and Scope

The primary purpose of this study is to evaluate whether establishing an Aerospace Port in the state of Hawai‘i is viable and, if so, where and how a Hawai‘i Aerospace Port can be developed in a safe, economically sound, and culturally responsible manner. The scope includes multiple options including “horizontal” launch operations (using existing runways and carrier aircraft or spaceplanes) and “vertical” launches (traditional rocket pads). The report covers four main sectors of demand (defense/government, scientific/educational, AAM/UAM/UAV, and commercial NewSpace) and presents a comparative analysis of over ten development scenarios.

Methods and Data Sources

The assessment was conducted through a combination of literature research, data analysis, and stakeholder outreach. Market forecasts were drawn from authoritative sources such as FAA launch projections and industry reports, e.g., BryceTech, 2023; Space Foundation 2025, and NASA studies (NASA, 2022). Site feasibility draws on prior environmental studies including a 2019 Draft EA for a Hawai‘i spaceport (Alaska Aerospace & FAA, 2019) and the 1990s Palima Point EIS (State of Hawai‘i, 1994) as well as new GIS analyses for launch trajectories and hazard zones. The consultant engaged with key stakeholders in Hawai‘i’s aerospace community to gather insights on local capabilities and concerns. Initial meetings were also held with community representatives on Hawai‘i Island to understand cultural and environmental priorities. All cost estimates in this report are order-of-magnitude and based on analogues from other spaceports and known unit costs; they should be reviewed by engineering experts as the plan progresses. Data on economic impact leverage Hawai‘i-specific multipliers (U.S. Bureau of Economic Analysis, 2024) and case studies from existing spaceports. Geographic context has been carefully considered: Hawai‘i’s island geography means limited land availability and proximity of communities to potential sites, as well as unique considerations like volcanic hazards and sensitive ecosystems. These factors are integrated into site evaluations and risk assessments throughout the report.

Hawai‘i’s Geographic Context

The Hawai‘ian archipelago lies in the central Pacific, roughly 2,400 miles from the U.S. mainland (NOAA, 2023). This isolation offers both advantages and challenges for aerospace operations. On one hand, the islands’ mid-Pacific position provides direct over-ocean launch routes that avoid land overflight – a critical safety advantage. For example, a launch due east from Hawai‘i can reach an equatorial orbit without the “dogleg” maneuvers needed from Cape Canaveral (where rockets must avoid overflying inhabited areas) (NASA, 2022; Alaska Aerospace & FAA, 2019). Likewise, a launch due south from Hawai‘i can achieve polar orbit with essentially no population downrange except open ocean (PISCES, n.d.). These open corridors are a major selling point for a Hawai‘i spaceport.

Hawai‘i’s small land mass means any launch site -horizontal or vertical- will be relatively close to communities or sensitive environmental areas, requiring careful site selection and robust mitigation (unlike the vast deserts and remote mainland sites). The state’s climate ranges from tropical rainy (Hilo, Puna) to arid (West Kaua‘i, Lāna‘i), which influences design considerations, e.g., drainage for heavy rain in Hilo vs. water supply on Lāna‘i (University of Hawai‘i, 2019). Hawai‘i Island is volcanically active – while proposed sites are outside the highest-risk lava zones, they are still in areas (Lava Hazard Zone 2 or 3) with a history of past flows within dozens of miles (USGS, 2021). The introduction of any aerospace infrastructure must account for these geographic factors.

Project Goals and Framework

To ensure a balanced development, four primary project goals were established, drawing from best practices at established U.S. spaceports (Virginia, Florida, Alaska, California, New Mexico) and aligning with broader frameworks such as NASA’s space sustainability principles and the FAA’s performance-based safety regulations. These goals also reflect Hawai‘i’s values and the UN Sustainable Development Goals (notably SDG 11: Sustainable Cities and Communities). The goals serve as a guiding framework for planning and a basis for measuring success over time. They are: Safety, Operational Efficiency, Sustainability (Financial & Environmental), and Community Alignment.

> Safety: Maintain the highest safety standards for all operations. This entails meeting or exceeding FAA commercial spaceflight requirements (14 CFR Part 420 for site licensing and Part 450 for launch licensing) (FAA, 2021a; FAA, 2021b) and ensuring launch/flight activities do not endanger the public, participants, or other

aircraft. Facility design must incorporate strict safety zones, e.g., ~7,300 ft radius clear zone for vertical launches per federal guidance (FAA, 2000) and robust range safety systems for autonomous flight termination, debris containment, etc. (FAA, 2021b). Metrics for safety must include compliance with all safety regulations, incident-free operation counts, and emergency response readiness drill results. Mitigation actions will include regular safety audits, community emergency planning (coordination with local Civil Defense), and establishing “no-fly” buffers and notice procedures for each launch.

Operational Efficiency: Leverage existing assets and optimize new infrastructure to meet market demands with minimal waste. Hilo’s airport, for example, provides an FAA-certified runway, control tower, and logistics access that can be repurposed for horizontal launches (State of Hawai‘i DOT, 2025). Efficiency means quick turnaround times between launches, high pad utilization, and streamlined processes for users. Metrics may include launch cadence (launches per year), average turnaround time between operations, and facility utilization rates. Actions will include adopting a joint-use model, e.g., shared hangars and control rooms (Alaska Aerospace Corp., 2021), utilizing modern telemetry and automation to expedite launch prep (NASA, 2023), and continuous reviews to improve procedures. The project will maximize use of existing infrastructure before building new, e.g., prove demand at Hilo before constructing an all-new site.

Sustainability (Financial & Environmental): Ensure the project is financially viable long-term and environmentally responsible. Financial sustainability will be evaluated by comparing forecasted revenues to costs and aiming for positive ROI within a reasonable period. Environmental sustainability requires minimizing impacts on Hawai‘i’s ecosystems and cultural resources. Metrics include cost recovery period, operating cost per launch vs. fee revenue, as well as environmental indicators, e.g. compliance with emissions/noise limits, successful implementation of mitigation measures. Actions involve phasing investments to match growth (avoiding large sunk costs up front), seeking diverse revenue streams (detailed in Section 8), and implementing rigorous environmental mitigation plans (noise suppression, debris monitoring, scheduling to avoid wildlife breeding seasons, etc.). No major expansion can proceed without proven mitigation in place and stakeholder approval (FAA, 2025; The Aerospace Corporation, 2022; NASA, n.d.).

Community Alignment: Proactively earn and sustain community support. This goal recognizes that a Hawai‘i spaceport must reflect local needs and respect cultural values. Metrics could include number of community meetings held, stakeholder survey results, and percentage of jobs filled by local residents. Qualitative indicators like support in public testimony or absence of legal challenges are also telling. Actions will center on outreach and benefit-sharing: establishing community advisory boards, holding “talk story” sessions in affected neighborhoods, providing cultural sensitivity training for project staff, and ensuring local hiring and STEM education programs are part of the project from day one. The project will only succeed if it improves quality of life for Hawai‘i residents and honors the concept of mālama ‘āina (caring for the land) (Civil Beat, 2019; Environment Hawai‘i, 2014) .

By balancing these four goals – Safety, Operational Efficiency, Sustainability, and Community Alignment – the initiative can deliver a technically sound and socially responsible Aerospace facility for Hawai‘i. Table 1 below summarizes these goals with example performance metrics and maintenance actions that HTDC and partners should implement to track progress. This performance management framework is inspired by NIST, 2020 and the FAA, 2025 own spaceport performance indicators. It will enable adaptive management such as regular reviews of leading indicators including safety compliance rates, community feedback, lagging outcomes such as economic returns, and incident responses so that the project can be adjusted in response to any issues or changing conditions.

Table 1. Project Goals and Performance Metrics

Goal	Key Performance Metrics	Maintenance Actions
Safety	– Compliance with FAA launch safety criteria (Part 420/450) – Number of incidents/accidents (aim for zero)	– Establish clear blast hazard areas (e. g. ~7, 300 ft radius) for launches – Conduct regular safety drills and FAA safety audits – Install autonomous flight termination and debris monitoring systems

Goal	Key Performance Metrics	Maintenance Actions
	– Emergency response times and drill success rate	
Operational Efficiency	– Launch cadence (launches per year) vs. target – Turnaround time between launches – Facility utilization rate (pad and runway downtime)	– Optimize scheduling via LOAs with FAA Air Traffic to minimize airspace closures – Leverage existing airport infrastructure to reduce new build needs – Continuous process improvement reviews each quarter
Sustainability *(Financial & Environmental)*	– Revenue/cost ratio (self-sufficiency by X year) – Capital recovery period (ROI in years) – Environmental compliance (e. g. zero violations, noise levels)	– Phase investments to match demand (avoid over-building early on) – Implement environmental mitigation plan (noise suppression, launch debris recovery) – Monitor and publicly report environmental indicators (wildlife, noise) annually
Community Alignment	– Local hire rate (% of jobs to local residents) – Community sentiment (survey approval ratings, testimony) – Number of outreach events and participants	– Form Community Advisory Board with Hawai‘ian cultural practitioners and local leaders – Hold bi-monthly community meetings (“talk story” sessions) – Offer internships, school programs, and ensure visible local benefits (improved infrastructure, etc.)

(Note: SDG = United Nations Sustainable Development Goal. The Community Alignment goal supports SDG 11 by fostering inclusive, sustainable communities.)

Market Demand and Feasibility Analysis

Hawai‘i’s Aerospace Port concept is grounded in demonstrable market demand. In this section, we evaluate four sectors ;(1) Defense/Government, (2) Scientific/Educational, (3) Advanced Air Mobility (AAM) & Unmanned Aerial Systems (UAV), and (4) NewSpace

Commercial ;and present evidence of addressable demand in each. Our analysis identifies viable use cases and customer segments across all four sectors, with Hawai‘i’s mid-Pacific geography, existing dual-use infrastructure, and research base providing distinct advantages. Realizing these opportunities will still require addressing logistics, workforce, and regulatory considerations. Details are outlined below for each sector’s growth outlook and Hawai‘i’s specific niches.

Defense and Government Launch Demand

U. S. military and government agencies are launching more payloads than ever and are continuously seeking even greater launch flexibility (Federal Aviation Administration, *Commercial Space Transportation Forecast, FY 2028*; U.S. Space Force, *Tactically Responsive Space (TacRS) Capabilities Roadmap*). Global government space spending reached $132 billion in 2024 (the U. S. accounted for $77 billion of that) (Space Foundation, *The Space Report 2025 Q2 – Government Space Spending*). The U. S. Space Force in particular, is emphasizing “tactically responsive space” – the ability to launch satellites or reconstitute assets on very short notice (U.S. Space Force, *Tactically Responsive Space (TacRS) Capabilities Roadmap*). This is exemplified by contracts like the $21.8 million Victus Sol mission awarded to Firefly Aerospace, which demonstrated a satellite launch on 24 hours’ notice (Erwin, “U. S. Space Force Awards Firefly $21.8 Million Contract for Rapid-Response Launch Mission”; Firefly Aerospace, “Firefly Awarded Launch Agreement for the U. S. Space Force Victus Sol Mission”). Recent responsive launch exercises (TacRL-2 in 2021 and Victus Nox in 2023) highlight the need for additional launch sites to avoid bottlenecks at Vandenberg and Cape Canaveral (SpaceNews, “Space Force’s TacRL-2 Mission Launches Under 21-Day Call-Up”; SpaceNews, “Victus Nox Sets 27-Hour Responsive-Launch Record”).

Hawai‘i could fill a gap by providing a Pacific launch venue for certain orbit profiles that are hard to achieve from the continental U. S (NASA, *Equatorial Launch Benefits*; Space Foundation, *The Space Report 2025 Q2 – Launch Cost Trends and Orbit Injection Penalties*). Notably, low-inclination (equatorial) orbits can be reached from Hawai‘i without costly “dogleg” maneuvers. Further, crowded West Coast ranges mean there is demand for alternate sites for polar and rapid launches (NASA, *Equatorial Launch Benefits*; “Vandenberg Expanding Small-Lift Pads to Ease Congestion”). For example, Vandenberg Space Force Base in California is near capacity for small-payload launches, and it cannot support equatorial trajectories at all.

Pacific Space Complex Alaska (PSCA) also cannot launch below 59° inclination (“Vandenberg Expanding Small-Lift Pads to Ease Congestion”; Alaska Aerospace Corporation, *Pacific Spaceport Complex–Alaska Master Plan –2030*). Hawai‘i Island’s geometry, by contrast, allows launches directly east or south over thousands of miles of ocean (Pacific International Space Center for Exploration Systems, “Site-Selection Rationale (Equatorial Corridor, Fiber, Roads)”; Alaska Aerospace Corporation and Federal Aviation Administration, *Draft Environmental Assessment: Pacific Spaceport Complex–Hawai‘i (Preliminary Draft)*).

The Pacific Missile Range Facility (PMRF) on Kaua‘i has already hosted suborbital hypersonic tests and orbital attempts (the ORS-4 mission in 2015), (U.S. Navy and Missile Defense Agency, “Successful Flight Test of Common-Hypersonic Glide Body from PMRF”; U.S. Air Force, “Hypersonic Test Campaign Fact Sheet; Operationally Responsive Space (ORS-4) After-Action Summary”) proving the concept on a small scale. Feasibility studies indicate that a modest orbital launch pad in Hawai‘i, if made available, would attract both government and commercial small launch vehicles looking for flexible scheduling (Tauri Group, *Economic Impact of Small Launch Ranges*; Alaska Aerospace Corporation and Federal Aviation Administration, *Draft Environmental Assessment: Pacific Spaceport Complex–Hawai‘i (Preliminary Draft)*).

Defense demand for a Hawai‘i vertical space launch facility is high, particularly to serve responsive launch needs and provide surge capacity when mainland ranges are busy (U.S. Space Force, *Tactically Responsive Space (TacRS) Capabilities Roadmap*; Alaska Aerospace Corporation and Federal Aviation Administration, *Draft Environmental Assessment: Pacific Spaceport Complex–Hawai‘i (Preliminary Draft)*). The main hurdles are regulatory (coordination with DoD for any PMRF use) and ensuring Hawai‘i can meet stringent security and range safety requirements for military missions (Federal Aviation Administration, *Launch Site Safety Requirements*; Aerospace Corporation, *Vertical Launch Site Design and Safety Requirements*).

Scientific and Educational Demand

Universities and research institutions are increasingly active in space, driving a surge in small satellite (CubeSat) launches and suborbital experiments. As of April 2025, 2,730 CubeSats had been launched globally, with ~1,900 more projected by 2029 (Kulu 2025). NASA’s CubeSat Launch Initiative and related STEM programs are fueling this growth. For example, NASA’s FY2025 budget allocates $143 million for STEM payload engagement, supporting over 1,250 U.S. institutions to get student-built satellites into orbit (NASA 2024).

Hawai‘i’s academic community has already contributed to this trend. The University of Hawai‘i’s HSFL built the HiakaSat small satellite and attempted a launch in 2015 (the Super Strypi launch from Kaua‘i),(Clark 2015) and more recently developed the HyTI CubeSat slated for a 2025 launch (NASA Small Spacecraft Office 2023). Additionally, the Project Imua consortium of community colleges has launched payloads on sounding rockets (Spectrum News Hawai‘i 2022).

The demand here is not just for orbital launches, but also for frequent suborbital launch opportunities, rocket testbeds, and near-space balloon or UAV platforms for research. Hawai‘i’s value proposition is that local teams could integrate and launch experiments without having to ship everything to the mainland. This will save time and decrease costs, which will enable more iterative, hands-on learning experiences.

For instance, a small sounding rocket launch site or high-altitude balloon launch facility on Hawai‘i Island could serve university experiments similar to how the Mid-Atlantic Regional Spaceport (MARS) at Wallops Island offers sounding rocket campaigns for academia (NASA Wallops Flight Facility 2022). A Hawai‘i Aerospace Port could also host educational payload slots on larger launches, potentially creating a revenue stream by selling excess capacity to university CubeSats. The Mid-Atlantic Regional Spaceport (MARS) at Wallops does this, and even Colorado’s non-orbital land-locked Space Port supports research activities (University of Colorado Boulder 2023).

Overall demand from the education/science sector is moderate to high. It is not likely to generate large revenue streams like defense or commercial, but it is steady and brings substantial collateral benefits such as STEM education and workforce development, providing space sector related jobs in Hawai‘i normally found only on the mainland. By catering to this sector, e.g., dedicating some launches or providing discounts for university payloads, Hawai‘i can establish itself as an academic aerospace hub in the Pacific. Sustained support for university-driven missions and local launch opportunities can expand Hawai‘i’s programs while strengthening talent retention, giving local graduates and young professionals compelling reasons to build their careers on the islands rather than leaving for opportunities elsewhere.

Advanced Air Mobility (AAM), Urban Air Mobility (UAM) & Unmanned Aerial Vehicle Demand

Hawai‘i’s dispersed islands and limited inter-island transport options make it an ideal testing ground and early adopter market for advanced air mobility solutions including cargo

drones, passenger eVTOL aircraft, and high-altitude long-endurance drones (U.S. DOT & FAA 2025). To frame these opportunities, here are key definitions grounded in FAA and industry standards:(FAA 2025a) (GAMA 2025)

- Advanced Air Mobility (AAM): A next-generation transportation system using electric or hybrid-electric aircraft, primarily electric Vertical Takeoff and Landing (eVTOL) to move people and cargo over short-to-medium distances that are typically 20–150 miles, often in urban, suburban, or regional settings. AAM includes both passenger and cargo operations and operates under FAA oversight with integrated air traffic management (FAA 2025a). In Hawai‘i, this translates to inter-island shuttles, medical evacuations, and disaster response, leveraging the state’s short hops and existing airports as vertiports.

- Urban Air Mobility (UAM): A subset of AAM focused on city-based operations, such as air taxis, drone delivery, and emergency services within or between densely populated areas. UAM emphasizes high-frequency, on-demand flights using vertiports on rooftops or near transit hubs (FAA 2025a). While less dominant in Hawai‘i due to its rural spread, UAM could apply in urban Honolulu, e. g., Waikīkī shuttles, requiring advanced Unmanned Traffic Management (UTM) systems.

- Unmanned Aerial Vehicles Demand: The market and operational need for Unmanned Aerial Vehicles (drones) across commercial, government, and research applications, including small delivery drones, large cargo UAVs, inspection platforms, and High-Altitude Pseudo-Satellites (HAPS) (FAA 2025a). Hawai‘i-specific drivers include agriculture crop monitoring, tourism, aerial filming, state and national defense, logistics and medical emergency supply deliveries, all enabled by the state’s open ocean airspace and regulatory environment.

Globally, the AAM/UAM market is surging. FAA forecasts project over 1.2 million commercial drones in the U.S. by 2026 up from 966,000+ in 2024 (FAA 2024) with the sector reaching $9.9 billion in 2024 and growing to $62.9 billion by 2033 at a 9.2% CAGR (IMARC Group 2025; Business Research Insights 2025). North America holds ~39–40% of the eVTOL market share as of 2024–2025,(Autonomy Global 2025a) driven by investment and regulatory support (Autonomy Global 2025b). Overall AAM growth is projected at 10–20% annually, hitting $40–$77 billion by 2033 depending on adoption rates (IMARC Group 2025).

Regulatory tailwinds are strong: The FAA’s Powered-Lift rules (finalized November 2024) pave the way for initial eVTOL services by 2026 (FAA 2024b). These trends align perfectly with Hawai‘i’s strengths, short inter-island distances, remote communities, and robust military footprint eyeing drone tech.

Use cases here span practical needs such as inter-island cargo delivery, medical supplies via UAVs, passenger hops in eVTOL seaplanes, persistent surveillance for volcano or hurricane monitoring, and disaster response. A standout example is the September 2025 REFORPAC exercise, where Joby Aviation demonstrated its Superpilot™ autonomous flight technology covering 7,000+ miles over the Pacific and Hawai‘i to validate long-range eVTOL ops for USINDOPACOM. This highlights DoD’s growing interest in Hawai‘i as a premier test venue (Joby Aviation 2025).

Local innovators are tailoring AAM to inter-island realities. REGENT Craft (formerly Regency) is advancing a statewide electric seaglider network, with its 12-passenger Viceroy prototype completing sea trials in March 2025 and targeting operational passenger/cargo service by 2028–2030 (Smart Cities Dive 2025). Using wing-in-ground-effect flight tech for efficient, zero-emission low-altitude over-water travel is possible at up to 180 mph. This initiative expanded with new partners in September 2025 directly supports Phase 1 at Hilo International Airport (ITO) via shared vertiports, electric charging, and telemetry (REGENT Craft 2025). Early Aerospace Port integration could kickstart revenue from pilot ops, draw investment, and establish Hawai‘i as a pioneer in maritime AAM certification, all while prioritizing low-noise, sustainable, mobility that resonates with community values.

An Aerospace Port in Hawai‘I, especially at Hilo, positions the state as a research and demonstration hub for AAM/UAV, offering controlled airspace, over-land and sea test ranges, infrastructure for electric grid charging, maintenance, and telemetry. Near-term demand is robust. Unlike orbital launches requiring rocket and federal licensing, AAM/UAV ops can scale small under existing rules. Hilo’s uncongested airspace and 9,800-ft runway suit beyond-visual-line-of-sight (BVLOS) testing perfectly.

This could lead to high-tech jobs, leadership in tropical/maritime certifications, and economic diversification. This segment is a smart early win for the Port. It taps Hawai‘i’s environment, eases community entry (drones feel less disruptive than rockets), and unlocks revenue via test fees while luring manufacturers to the islands.

NewSpace Commercial Demand

The “NewSpace” sector refers to the wave of private space companies focusing on small satellites, launch vehicles, and in-space services. In 2024, the global space economy reached $613 billion, with commercial activity making up 78% of that (Space Foundation 2025). Venture capital and private equity are heavily invested in NewSpace, as evidenced by the 2024 deal statistics mentioned earlier. Small satellite launch services alone represent a $3. 5 billion market, with ~13, 000 small sats (<500 kg) expected to launch in the 2020s (BryceTech 2024). Companies like Rocket Lab have captured 40–50% of this small-launch market (Global Market Insights 2025). Many new launch startups (Firefly, Astra, Relativity, ABL, etc.) are seeking launch sites. While major launch bases are in Florida and California, there is a growing commercial interest in diversified sites for specialized orbits, responsive schedules, or closer proximity to customers.

Hawai‘i could attract some of this interest by offering unique launch azimuths (as previously discussed) and an “uncrowded” range with quick turnaround potential. For example, a small launch vehicle that needs an equatorial orbit could launch due east from Hawai‘i (something not possible from other U. S. spaceports except very south Texas). Horizontal launch systems could operate from Hawai‘i’s airports with minimal modification. Virgin Galactic’s next-gen Delta-class spaceplanes are targeting 2026 for flights and are looking for secondary spaceport locations (Wall 2025). Similarly, companies developing air-launch rockets, e. g., Fenix Space’s towed glider which only needs a runway, have expressed interest in diverse launch sites (NASA Armstrong 2022). The commercial demand is therefore broad. It includes small launch vehicle providers needing pad space, spaceplane tourism or microgravity flights, High-Altitude Pseudo-Satellites (HAPS) operations, and more. Hawai‘i’s advantage for commercial operators is not in competing with Cape Canaveral for heavy launches, but in providing a flexible, rapid-response, and possibly cheaper alternative for small to medium payloads.

Table 2 consolidates the demand forecasts and highlights Hawai‘i’s advantages and potential local “fit” for each sector. This summary underscores that no single sector alone would likely justify a spaceport, but together they create a strong business case – especially if development is phased and scalable to actual demand.

Table 2. Sector Demand Forecasts (2024–2034) and Hawai‘i’s Advantages

Sector	2024–2034 Growth Projection	Hawai‘i Advantage	Local Fit Potential
Defense/Gov	$77 B U. S. gov’t spend (2024) 174→566 U. S. launches (FY25→FY34)[79] [44]	Equatorial launch access; vast over-ocean corridors; relieves mainland range congestion	PMRF & Hilo enable rapid-response launches, e. g. Victus Sol mission [26], support tactically responsive Space Force needs
Education/Science	2, 730 CubeSats launched (Apr 2025) → +1, 900 by 2029[76] NASA $143 M FY25 STEM budget[77]	Local UH expertise (HSFL); Maunakea observatories; existing student programs	Use Hilo as a suborbital & CubeSat launch hub – integrate payloads on-island, launch small rockets or balloons; frequent educational flight opportunities
AAM / UAV	$11. 5 B → $73. 5 B global AAM market (2024→2034)[5] ~858k drones in U. S. by 2026[37]	9, 800-ft runway at Hilo; low-traffic BVLOS airspace; island geography ideal for eVTOL routes	Disaster response drills, inter-island seaglider trials, drone delivery networks; each test site (e. g. Hilo, PMRF) creates 10–15 local tech jobs and attracts manufacturers
NewSpace (Commercial)	$613 B global space economy (2024)[96] ~13, 000 small sats to launch by 2030[68] (15%+ CAGR)	Low-inclination orbits possible; minimal air traffic = flexible scheduling; uncluttered launch range	70–90 direct on-site jobs (105–135 incl. multiplier) from mixed ops[14] [15] [64] Hawai‘i as Pacific testbed for new launch tech (air-launch, small pads); anchor for Pacific space tourism (Virgin Galactic)

Sources: Federal Aviation Administration forecasts; Space Foundation reports; NASA and industry analyses (footnotes as shown).

Hawai‘i’s combined value proposition leverages the unique geography (equatorial proximity, ocean buffers) and existing infrastructure for providing a range of services from UAV test ranges to orbital launches to capture diversified demand. The feasibility is strong if development is phased and thoughtfully managed. The next sections will examine site options and how historical attempts inform the approach, followed by detailed concept and option comparisons for development.

Historical Context and Present Site Evaluation

Multiple sites in Hawai‘i have been studied over the years for aerospace use, especially for vertical rocket launches. Understanding this history is crucial – it reveals both technically viable locations and the facets that derailed previous projects. This section reviews the major sites evaluated on Hawai‘i Island (and elsewhere) and summarizes their advantages, challenges, and lessons learned. Table 3 provides a comparative overview of these past site proposals and their outcomes (McNarie 2019; Honolulu Civil Beat 2019; Environment Hawai‘i 1993; PISCES 2019; Alaska Aerospace Corp. & FAA 2019). The key takeaway is that while several Big Island locations are technically feasible for launch, issues such as lava hazard risk, cultural opposition, potential environmental impact, and community mistrust have been primary blockers (McNarie 2019; Dawson 1993; Kubota 2019; Honolulu Civil Beat 2019). These lessons directly inform our current recommendations, e. g., the emphasis on community alignment and phased trust-building).

Past Evaluated Sites: The focus has been on Hawai‘i Island given its large land area and southern latitude, though other islands have occasionally been considered. Major site candidates have included:

- Hilo International Airport (ITO) and Nearby Properties, East Hawai‘i: In the early 2000s, county officials floated the idea of an “Aerospace Technology Park” near ITO. The concept was to use the industrial lands by the airport for assembling small rockets or hosting support facilities, with actual launches either at the airport (horizontal) or a coastal pad nearby. Hilo offers excellent logistics (port, roads, power) and an equatorial launch azimuth (due east over the ocean) (PISCES n.d.; State of Hawai‘i DOT 2025). However, community concern arose even at comparisons that a rocket launch would be “no louder than today’s jets” – neighbors already annoyed by airport noise did not find that reassuring (Honolulu Civil Beat n.d.). No formal launch site was built. Instead ITO has continued as a conventional airport. Lesson: Even at an existing airport, rocket operations raise sensitivity. Early engagement and realistic noise analysis are needed. Hilo remains a viable site for horizontal launches and as a support base for vertical operations (integration, processing) (FAA 2025; State of Hawai‘i DOT 2025).

- K ea‘au (W. H. Shipman Estate), Puna, East Hawai‘i: This site (~10 miles south of Hilo) was the focus of a 2019 proposal by Alaska Aerospace Corporation (AAC) to build a commercial small-rocket launch facility. The plan envisioned a 12–13 acre

complex on private land near Ha‘ena Point, with up to two pads for rockets ~40–60 ft tall (Honolulu Civil Beat 2019; Alaska Aerospace Corp. & FAA 2019). The site offers direct over-ocean launch corridors (due east for equatorial or slightly south for ISS inclinations) and has relatively good road and fiber-optic connectivity (Shipman land is partially developed) (PISCES n.d.). It’s also moderately isolated – about 3 miles from the nearest residential farm lots and 1.5 miles from the popular Ha‘ena beach park. Those distances are not huge, but better than other East Hawai‘i options. A state-funded Environmental Assessment (EA) process commenced in 2019 with public meetings (PISCES 2019; Alaska Aerospace Corp. & FAA 2019). Supporters highlighted jobs and STEM opportunities; opponents raised concerns about lava zone risks (Puna is in Lava Hazard Zone 2, with recent eruptions in 2018) and potential impacts to the coastline (noise, rocket debris) (Kubota 2019; Honolulu Civil Beat 2019). Ultimately, that EA was put on hold after significant community pushback and the 2019 change in the Hawai‘i County leadership (Honolulu Civil Beat 2019). Status: Kea‘au remains a contender – it is a ptoential “current test case” for whether a small launch pad can gain community acceptance in Hawai‘i. Any renewed effort there must directly address volcanic risk (e. g. emergency plans for eruption disruptions) and convincingly show that safeguards will protect the community and environment (Honolulu Civil Beat 2019; Kubota 2019).

- Ka Lae (South Point), Ka‘ū, South Hawai‘i: South Point is the southernmost tip of the Big Island (and the U. S.), a remote windswept cape. In the 1960s it hosted a NASA tracking station (Honolulu Civil Beat, McNarie 2019) and in the 1980s–90s it was eyed for polar orbit launches (a 1989 Air Force study considered it for small launchers). The appeal is clear: It has 360° ocean around for hundreds of miles, particularly south and east, making it ideal for polar and retrograde orbits with virtually no population exposure. However, South Point is also of profound cultural significance and is surrounded by sensitive lands (including Hawai‘ian Home Lands) (Department of Hawai‘ian Home Lands n.d.). Past proposals met fierce community and cultural opposition in Ka‘ū – residents felt they would shoulder all the risk for little benefit, and many viewed the project as a desecration of sacred land (Honolulu Civil Beat, McNarie 2019). The site lacks infrastructure (no paved roads to a pad location, no power or water, etc.). Efforts to develop South Point always stalled early due to community outcry and political resistance (Honolulu Civil Beat, McNarie 2019). Lesson: Even a technically “perfect” site fails if it doesn’t have social license. Ka‘ū’s strong sense of stewardship for land (“aloha ‘āina”) means any project there would need overwhelming support, which is unlikely unless led and

owned by the community itself. South Point’s history teaches the importance of perceived fairness and respect.

- Cape Kumukahi (Kapoho), far East Hawai‘i: This cape in Puna, near Cape Kumukahi lighthouse, was evaluated in the early 1990s for an equatorial launch site. It offered an optimal due-east trajectory. However, it lies in Lava Hazard Zone 1 (high risk; in fact much of that area was later covered by lava in 2018),(USGS 2018; Hawai‘i County 2020) and analyses at the time found that radar tracking of launches could interfere with the sensitive telescopes on Mauna Kea and with the VLBA radio telescope network (Hawai‘i DBEDT 1993). Consequently, Cape Kumukahi was dropped from consideration. Lesson: Safety and compatibility extend to other industries – protecting Hawai‘i’s world-class astronomy from radio interference was a deciding factor. Also, any site in Lava Zone 1 is likely untenable due to insurance and risk.

- Palima Point (near Pohuʻe Bay), Ka‘ū Coast: This site near Ocean View on Ka‘ū’s southwest coast was the subject of the most advanced previous plan – the late-1980s “Commercial Satellite Launching Facility” proposed by a state office. Palima Point had a comprehensive Draft EIS in 1993**(Hawai‘i DBEDT 1993)** examining a spaceport for Delta II-class rockets. Technically, it passed all criteria: It could support both equatorial and polar orbits, had adequate land for infrastructure, and the EIS suggested impacts could be mitigated. However, when worst-case scenarios were publicized (e. g. the possibility of a catastrophic rocket failure spreading toxic gases or debris, and the need to transport large volumes of rocket fuel from Hilo harbor through communities), public opposition skyrocketed. Ka‘ū residents organized against the plan, arguing they were being asked to accept significant risk (hazardous fuel convoys, potential accidents) for uncertain benefit – hence the phrase “risk without reward (Dawson 1993; Haber and Lamoreaux 2012). By 1994 the plan was shelved, despite its technical merits**(Environment Hawai‘i 2014)**.[67] Lesson: Absolute transparency is needed in disclosing risks, and if the community does not feel the project is for them, it will not survive. The Palima case also underscores the importance of emergency planning (something this report addresses in risk mitigation recommendations) – communities need to know exactly how risks like fuel transport are handled.

Table 3 summarizes these site evaluations and outcomes, along with key lessons for the current initiative. Notably, Hilo and Kea‘au emerge as promising with caveats, South Point

and Palima highlight critical cultural and safety pitfalls, and other islands (like Lāna‘i, discussed in Options, or O‘ahu’s North Shore considered for UAV tests) each have unique community dynamics. This history informs our recommendation to pursue a Distributed Network (Option X) cautiously – multiple smaller sites might face less concentrated opposition if done in partnership with each local community. The bottom line is that trajectory geometry alone is not enough – a successful site must align physically, environmentally, *and socially* with its surroundings.

Table 3. Historical Launch Site Proposals in Hawai‘i – Feasibility and Outcomes

Site (Location)	Proposal Summary	Outcome/Status	Key Lessons Learned
Hilo International Airport (East Hawai‘i Island)	Concept for Aerospace tech park & horizontal launches using existing 9, 800' runway; potential integration of small rockets at airport.	Not formally pursued as launch site (airport continues normal ops). Recent interest revived as horizontal launch site under phased approach.	Excellent infrastructure & equatorial corridor, but community already sensitive to noise (jets). Need clear noise analysis & outreach even for airport-based operations. Hilo ideal for Phase 1 (horizontal) if managed with community input.
Kea‘au (Shipman), Puna (East Hawai‘i)	2019 proposal for 12-acre small-rocket spaceport on private estate land ~10 mi south of Hilo. Two pads for ~50 ft rockets; equatorial launches over ocean. EA process started with public meetings.	*On hold/stalled.* Initial support from some officials; significant local opposition over lava risk (Zone 2) and coastal impacts. No final approval to date.	Technically feasible (road, fiber in place; moderate isolation: 3 mi from homes). Private landowner support is a plus. However, being in lava-prone zone and near communities demands robust risk mitigation and genuine community benefits. Intensive outreach and emergency planning are musts before reattempting.
Ka Lae – South Point (Ka‘ū, South Big Island)	Various studies (80s–90s) for polar launch site. Remote coastal tip with 360° ocean range, ex-Air Force tracking site. Minimal infrastructure (rugged access).	Abandoned due to strong Native Hawai‘ian cultural objections and community resistance. Area has deep cultural/historical significance; also lacks roads/utilities.	Cultural preservation can trump technical ideality. Any site with sacred sites or on Hawai‘ian Home Lands requires early consultation and likely is off-limits unless community-led. Also, infrastructure absence makes it costly. Reinforces:

Site (Location)	Proposal Summary	Outcome/Status	Key Lessons Learned
			“Just because you can build it there doesn’t mean you should.
Cape Kumukahi (Kapoho) (East Puna, Big Island)	Early 1990s equatorial launch concept. Flat lava cape in far east Hawai‘i. Would require new pad build; very remote from population.	Rejected in feasibility stage. In Lava Hazard Zone 1 (high eruption likelihood). Tracking operations would have interfered with Mauna Kea astronomy and other observatories (unacceptable to science community).	Avoid high geological risk zones and conflicts with existing critical science installations. In Hawai‘i, astronomy is an important stakeholder – radar and radio interference must be assessed for any site (learn from Kumukahi and include observatories in reviews).
Palima Point (Pohu‘e) (SW Ka‘ū, Big Island)	Late-80s/early-90s state-led plan for full-scale orbital spaceport (Delta II class). Detailed Draft EIS completed 1993. Technically passed all criteria (could reach multiple orbits; site layout designed for large rockets).	Cancelled after public outcry. Community feared potential launch accidents (“toxic cloud” scenario) and resented risk burden (fuel convoys through towns). “Risk without reward” became rallying cry; project dropped by mid-90s.	Trust and transparency are critical. The community must be a partner, not an afterthought. Palima’s failure shows that even ideal engineering can’t overcome public mistrust. Future efforts must include the public in planning, offer clear benefits to locals, and have emergency response plans that people believe in.

Current Development Concepts

In brainstorming how Hawai‘i could develop its Aerospace Port, a wide range of concepts were considered – from minimal modifications of existing facilities to building a comprehensive multi-use spaceport – and then distilled those into ten primary options plus one multi-site alternative. Each option represents a distinct scenario with different emphasis (horizontal vs. vertical launches, location choice, scale of build-out, etc.). To facilitate comparison, we group the options by type, outline the pros and cons below, and present them side-by-side in Table 4. The options analyzed are:

- **Option 1:** Horizontal-Only Launch at Hilo International Airport (Hawai‘i Island)
- **Option 2:** Vertical-Only Launch on Private Land Near Hilo (Kea‘au, Hawai‘i Island)
- **Option 3:** Phased Hybrid Development – start with Hilo horizontal, then add a vertical site (Hawai‘i Island or elsewhere)

- **Option 4:** Horizontal-Only Launch at PMRF (Kaua‘i)
- **Option 5:** Vertical-Only Launch at PMRF (Kaua‘i)
- **Option 6:** Hybrid Launch Complex at PMRF (Kaua‘i) – both horizontal and vertical at the same base
- **Option 7:** Horizontal-Only Launch on Lāna‘i (at Lāna‘i Airport)
- **Option 8:** Vertical-Only Launch on Lāna‘i (coastal private land)
- **Option 9:** Hybrid Launch Complex on Lāna‘i (both horizontal & vertical)
- **Option 10**: “No Build” – i. e. maintain the status quo, with no new Aerospace Port (the baseline alternative)
- **Option X:** Distributed Island Launch Network – a multi-site approach using a combination of smaller facilities on multiple islands instead of one centralized spaceport.

Aerospace Port Concepts

To meet Hawai‘i’s aerospace needs, this assessment considered several Aerospace Port configurations – horizontal launch sites (runway-based, like airports), vertical launch sites (traditional rocket pads), and hybrid combinations. In total, ten development scenarios (plus an alternate multi-site concept) were evaluated, each with different costs, timelines, benefits, and challenges.

Even a modest spaceport operation could create around 50–60 direct local jobs by 2030 with more as operations expand (Tauri Group 2023). Hawai‘i’s leaders are showing interest , as shown with 2025 bill SB581 proposing a state aerospace program (LegiScan 2025), but success will hinge on building community trust through transparency and cultural respect. Past proposals faltered due to insufficient outreach. Any option must therefore prioritize community engagement and local benefits from the start.

Horizontal Launch Approach (Runway-Based)

Horizontal launch operations use aircraft runways and carrier vehicles (like jet aircraft or spaceplanes) to send payloads aloft. A rocket is carried to high altitude and released, igniting in the air instead of from the ground. For example, Virgin Orbit used a modified Boeing 747 (“Cosmic Girl”) to air-drop its LauncherOne rocket (Virgin Orbit 2023), and Virgin Galactic launches SpaceShipTwo spaceplanes from a carrier aircraft (Wall 2025). Horizontal launch sites essentially operate like airports, requiring long runways, hangars, and fueling facilities – often by repurposing existing airports (as was done at Mojave Air and Space Port in California (Mojave Air and Space Port n.d.) or Spaceport Cornwall in the UK) (Cornwall Council & UK Space Agency 2023). In Hawai‘i, a horizontal spaceport could be

established at an existing airport such as Hilo International or Lāna‘i Airport with relatively low upfront cost. Estimated infrastructure upgrades on an existing runway (for telemetry antennas, hangars, etc.) are on the order of $3–5 million (Deloitte 2024). Advantages of the horizontal approach include flexibility and quick turnaround. Carrier aircraft can take off in various weather conditions or relocate if needed, and reusable planes can land and re-launch rapidly. This approach is well-suited for smaller payloads, e.g,. small satellites, technology demonstration flights, and suborbital missions like space tourism or scientific high-altitude experiments. It could also support the emerging advanced air mobility (AAM) sector (drones, eVTOL vehicles) as a test center. Horizontal launch operations would still require licensing by the Federal Aviation Administration (FAA) as commercial space activities and would also undergo environmental assessments similar to other spaceports (NEPA/HEPA).

Vertical Launch Approach (Pad-Based)

Vertical launch sites involve rockets lifting off vertically from fixed pads, as in a traditional rocket launch. (Imagine a smaller-scale Cape Canaveral/ Kennedy Space Center pad.) These facilities have launch pads with flame trenches, support towers, fuel storage farms, and extensive safety clear zones. Vertical launch infrastructure can support larger payloads and orbital missions because the rockets lift off under full power, but they require dedicated range safety measures (tracking radar, downrange safety corridors) to ensure public safety. For Hawai‘i, potential vertical launch locations include the Pacific Missile Range Facility (PMRF) on Kaua‘i or a private parcel near Hilo (Kea‘au area). Developing a new vertical pad is a bigger endeavor – on the order of $15–25 million (or more) for construction of the pad, control facilities, and instrumentation (Deloitte 2024). Advantages of a vertical site in Hawai‘i include the ability to reach a wide range of orbits. Hawai‘i’s southerly latitude offers performance benefits for equatorial launches (more initial Earth rotational speed) (NASA 2022); its ocean geography provides clear downrange corridors for polar launches without overflying population. A vertical launch site could thus handle orbital small satellite launches and even defense-related missions; indeed, PMRF has experience with missile and rocket tests (e. g. a 2020 hypersonic test) (U.S. Navy / MDA 2020) demonstrating the feasibility. Challenges are significant: vertical launches involve higher cost and complexity, greater sensitivity to weather, and larger safety buffers. They also tend to spark more community concern due to noise and the perceived risk and environmental impact (especially in culturally or environmentally sensitive areas). Any vertical launch site in Hawai‘i would require thorough federal and state environmental reviews (FAA NEPA process, Hawai‘i HEPA compliance, local permits), and extensive

community consultation to proceed sustainably. A vertical launch port cannot be established at existing airports.

Hybrid Approach (Combined Horizontal + Vertical)

A hybrid approach would combine both horizontal and vertical launch capabilities, seeking to capture the benefits of each. Practically, this could mean starting with a horizontal launch facility for quick, low-cost wins and later adding a vertical pad for full orbital launch access. This phased strategy – one potential path that sequences horizontal and vertical capabilities– allows Hawai‘i to enter the aerospace market quickly with minimal risk, then scale up once initial operations prove successful. In our analysis, an integrated hybrid spaceport was projected to cost roughly $18–30 million in total, implemented over a 2–5 year period (Deloitte 2024). This approach balances scalability and risk: the horizontal component generates early revenue and experience, while the vertical component unlocks heavier-payload and orbital missions once the state and community are ready.

In the Hybrid scenario, Hawai‘i’s geography would be fully leveraged. Horizontal launches can safely occur over the ocean, and vertical launches can target a variety of orbits (equatorial or polar) thanks to the islands’ mid-Pacific location (NASA 2022). Both federal and state regulatory frameworks (FAA licenses, coastal zone permits, etc.) would apply as needed, ensuring safety and environmental protection in either mode. Overall, horizontal and vertical approaches involve a trade-off. Vertical rocket pads maximize performance – they can send larger payloads to orbit and support a wider range of missions – but demand more complex infrastructure, larger safety exclusion zones, and can have greater noise and environmental impacts on the community. Horizontal runway launches, in contrast, trade off some performance and payload capacity for significantly lower cost, faster setup using existing airports, and generally smaller noise footprints (more akin to loud aircraft). The hybrid strategy aims to get the “best of both” over time: immediate economic and educational benefits from small-scale operations, and long-term access to the booming orbital launch market – all while managing community impact in stages.

With these approach types in mind, the study developed and analyzed ten specific development options (plus one alternate concept) for a Hawai‘i Aerospace Port. Each option is summarized below with its estimated cost, timeline, and key pros and cons.

Aerospace Port Development Options

Option 1: Horizontal-Only Launch at An Existing Airport on Hawaii Island

Overview: Develop a low-cost, quick-start horizontal launch facility at and existing Airport on Hawai‘i Island. This option envisions using Hilo’s existing 9,800-foot runway (AirNav LLC 2025) or and airport infrastructure to support horizontal launch operations – for example, flights by carrier aircraft that air-launch small rockets, spaceplane takeoff and landing, high-altitude drone tests, and advanced air mobility vehicle trials and vertically launched drones. Only minor upgrades would be needed (on the order of $3–5 million, taking about 1–2 years), (Deloitte 2024) such as adding telemetry antennas, a dedicated hangar or integration area, and other range safety equipment. Hilo’s FAA-certified tower, radar systems, (State of Hawai‘i DOT 2025) and adjacent deep-water port (State of Hawai‘i DOT Harbors 2025) are valuable existing assets that this option would leverage. Initially, this site would handle suborbital and atmospheric missions only – no vertical space launches to orbit – so it serves as a stepping stone into the aerospace sector rather than an immediate orbital launch site (FAA 2025; Virgin Orbit 2023).**

**It is notable that Kona (Ellison Onizuka Kona International Airport) is a secondary, but viable option for a horizontal launch site in Hawaii. Kona airport boasts an 11,000 ft long runway, existing infrastructure and potentially viable airspace. However, it remains secondary to Hilo for the following reasons: Space to expand around the Kona airport is limited. Unlike Hilo, it does not reside near an industrial corridor, but rather its neighbors include several high-end resorts that oppose additional industrial development in Kona (Hawai‘i Department of Transportation, Airports Division n.d.-a; Hawai‘i Department of Transportation, Airports Division n.d.-b; Hawaii Aviation n.d.); available over-ocean launch trajectories to the west or northwest of Kona are limited (less favorable for many orbital inclinations) (Burke, Falck, and McGuire 2010; Utah State University n.d.; “3.5 Orbital Mechanics” n.d.; Ray 2011), Kona also has limited military or defense integration compared to Hilo or O‘ahu, which makes it a less compelling location for dual-use missions. Dual-use missions would require additional infrastructure that already exists at Hilo (Derrick 2024). While Kona is a viable option, our research indicates that Hilo remains the more strategic first-mover option.

Pros:

- Minimal cost and quick setup: Takes advantage of Hilo’s robust existing airport facilities (long runway, control tower, radar, nearby harbor) with very little new

construction or investment. This means the spaceport could become operational within a couple of years, lowering the barrier to entry (Deloitte 2024).

- Proven model: Several U. S. spaceports have successfully started this way – converting airport runways for horizontal launches – which provides a proven path to obtaining FAA licensing and beginning operations (Mojave Air and Space Port n.d.; Boom Supersonic 2025; Cornwall Council & UK Space Agency 2023).

- Supports growing industries: Well-suited for the burgeoning unmanned aerial vehicle (UAV), drone, and eVTOL (electric vertical takeoff and landing) markets. Hilo could become a testbed for advanced air mobility (AAM) and small payload launches, supporting local tech development and STEM education opportunities. This aligns with “NewSpace” startup activities and could directly create dozens of high-skilled local jobs as early as 2030 (Frost & Sullivan 2024; IMARC Group 2024; Tauri Group 2023).

Cons:

- No immediate orbital capability: Air-launched and horizontal systems alone cannot reach orbit without significant new technology development (e. g. a much larger carrier aircraft or rocket), so this option would forgo near-term orbital launch opportunities. Hawai‘i might miss out on attracting orbital launch customers until a vertical launch site is added. (NASA 2022; Virgin Orbit 2023)

- Operational constraints at a civil airport: Running space launch activities out of a commercial airport could introduce noise and scheduling issues. For instance, rocket carrier jet flyovers or spaceplane takeoffs might be louder than typical aircraft and could disturb local communities and tourists. They also must be scheduled around passenger flights, potentially limiting flexibility. Hilo residents would need assurance that noise and safety are being managed (Honolulu Civil Beat n.d.; FAA 2025).

- Limited growth without expansion: By itself, a horizontal-only port might not capture the full NewSpace market. If demand grows for true orbital launches, Hawai‘i would eventually need to add a vertical launch pad or partner with an existing vertical spaceport elsewhere. In other words, Option 1 is an excellent first step but not a

complete long-term solution for all aerospace opportunities (BryceTech 2023; FAA Office of Commercial Space Transportation 2025).

Option 2: Vertical-Only Launch on Private Land Near Hilo (Kea‘au)

Overview: Construct a new vertical rocket launch site on a privately owned parcel of land near Hilo (for example, the W. H. Shipman property in the Kea‘au area, roughly 10 miles south of Hilo). This option envisions building a dedicated orbital launch pad and support facilities (fuel storage, integration hangar, control center, etc.) on the Big Island’s eastern shore. The site in consideration is about ~12 acres of former sugarcane plantation land – relatively flat, with existing road access and nearby utilities which would keep the construction footprint modest (Alaska Aerospace Corp. & FAA 2019). Development is estimated to cost $15–25 million and take 3–5 years (Deloitte 2024). The location offers excellent launch trajectories: rockets could launch eastward for equatorial or low-inclination orbits, taking advantage of Earth’s rotation, or southward for polar orbits, with clear downrange over the Pacific Ocean (NASA 2022). Being on private land means the operation would be entirely civilian-controlled, potentially allowing more flexible partnerships and faster permitting than a military site (Honolulu Civil Beat 2019).

Pros:

- Ideal orbital launch geometry: A coastal pad near Hilo at Hawai‘i’s latitude can capitalize on extra velocity for equatorial orbits, plus it has open ocean to the east and south enabling both equatorial and polar launches without overflight of populated areas. This makes it a highly attractive location for commercial small satellite launches that require those orbits (NASA 2022).

- Private land flexibility: Since the site is privately owned, development could be streamlined through direct partnership with the landowner or a private operator. This avoids the scheduling conflicts and bureaucracy that might come with federal/military sites, allowing more control over launch timing and facility use. Local industrial zoning near Hilo and proximity to Hilo’s harbor would also ease logistics (bringing in rocket stages, propellants, etc.) and encourage integration with local businesses (Honolulu Civil Beat 2019).

- Modest footprint and infrastructure: The proposed parcel (~12 acres) is relatively small and already accessible, meaning the construction scope is contained. Existing roads and utilities can be tapped, and the flat terrain simplifies pad construction. This keeps costs and land disturbance lower than building a large

spaceport from scratch. It also concentrates development in an area that has seen industrial use historically, which may mitigate some community concerns compared to a pristine site (Alaska Aerospace Corp. & FAA 2019).

Cons:

- Volcanic hazard area: The site is in the Puna district, which is volcanically active. While the specific lot is just outside the highest-risk lava flow zone, the broader region is not without risk – as seen in the 2018 Kīlauea eruption in lower Puna (U.S. Geological Survey 2018). Any long-term facility would have to consider the possibility (even if low probability) of lava flow threats or seismic activity, which could impact insurance and design.

- Contaminated soil from past use: Decades of sugarcane agriculture left elevated arsenic and DBCP pesticide residues in the soil (Hawai‘i Department of Health 2007). Construction would require soil remediation and worker safety measures to avoid health hazards. This adds to project cost and complexity, and the site would need environmental cleanup regardless of the spaceport to ensure safety.

- Community and cultural concerns: There are nearby communities – including Pana‘ewa Hawai‘ian Home Lands about 3 miles away – that might strongly object to rocket launches due to noise, perceived safety risks, and environmental impact (Mapcarta n.d.). Public opposition has stalled similar projects in Hawai‘i in the past, so earning local trust would be a major hurdle. Robust outreach, transparency, and cultural sensitivity would be mandatory (Kubota 2019; Honolulu Civil Beat 2019).

- Greenfield development challenges: Unlike using an existing airport, this option requires building everything from scratch – launch pad, flame trench or flame duct, propellant storage farms, a control bunker – which introduces complexity and regulatory hurdles. Full environmental impact studies would be needed, and obtaining an FAA spaceport license for a brand-new site involves a rigorous process. These requirements could extend the timeline if not managed proactively (Federal Aviation Administration 2025; Code of Federal Regulations 2025).

Option 3: Phased Hybrid Development (Hilo First, Then Add Vertical Site)

Overview: Pursue a phased hybrid approach, beginning with horizontal launch operations at Hilo Airport and adding a vertical launch site as a second phase. This two-step strategy is the recommended approach in the assessment. Phase 1 would implement the Hilo

horizontal launch capability (essentially Option 1) to achieve an early operational status, generate initial aerospace activity and revenue, and build public confidence. Phase 2 would occur a few years later and involve establishing a vertical rocket launch facility at a suitable isolated site, once regulatory approvals are secured and community buy-in is achieved. The vertical site for Phase 2 could be chosen based on Phase 1's experience and partnerships – candidates include PMRF on Kaua‘i (especially if defense/hypersonic launch demand grows), (Sandia National Laboratories 2024) the Kea‘au private site near Hilo (for equatorial or commercial demand), (Alaska Aerospace Corp. & FAA 2019) or even Lāna‘i if circumstances allow (Hawai‘i Department of Transportation 2024; Maui News 2020). The combined phased program is estimated at $18–30 million total investment over 2–5 years, spreading costs over that period (Deloitte 2024). This option emphasizes starting small and learning, then scaling up in a flexible way.

Pros:

- Scalable with lower initial risk: By starting small (Phase 1 horizontal) Hawai‘i can enter the aerospace market quickly at minimal cost, then scale up gradually to orbital launches once the concept is proven and demand is clear. This staged investment approach reduces upfront financial risk and allows adjustments along the way (Deloitte 2024).

- Builds community trust early: Importantly, Phase 1 at the airport provides a chance to demonstrate safe operations and tangible local benefits (jobs, STEM education programs, etc.) on a smaller scale before any loud rocket launches occur. This can help alleviate public fears – as the community sees successful drone or spaceplane tests with no major issues, they may become more comfortable with the idea of expanding to rockets. It's a way to earn trust incrementally (NASA / ACTA Inc. 2012).

- Flexibility to choose the best vertical site: By the time Phase 2 is ready, the state can use knowledge from Phase 1 to make an informed decision on where and how to build the vertical pad. For example, if there is high commercial demand for equatorial launches, the Hilo/Kea‘au site might be prioritized; if defense or polar missions dominate interest, then PMRF on Kaua‘i could be the better choice (NASA 2022; Sandia National Laboratories 2024). This option keeps those paths open. In essence, Hawai‘i can capture a broad range of markets (small commercial launches, government/defense launches, AAM testing) over time by adding capabilities as needed, rather than betting everything on one configuration upfront (FAA Office of Commercial Space Transportation 2025).

Cons:

- More moving parts to manage: Executing two sequential projects (and potentially running two sites in parallel eventually) adds complexity in planning and coordination. The state would need to manage funding and logistics for Phase 1 and Phase 2, possibly dealing with different regulatory processes and stakeholder groups for each site. Strong project management is essential to keep the phased approach on track (Deloitte 2024).

- Phase 2 depends on Phase 1 success: If the initial horizontal operations in Phase 1 encounter problems – say, community pushback, environmental issues, or lower-than-expected usage – then the follow-on vertical expansion could be delayed or derailed. There's a dependency: Phase 1 alone cannot meet all launch needs, but if it fails to build momentum or runs into serious opposition, Phase 2 might never get off the ground. This makes the execution of Phase 1 critical (Honolulu Civil Beat 2019; Kubota 2019).

- Momentum and funding must be sustained: If there is a long gap or loss of momentum between phases, Hawai‘i risks losing market share to competitors that pursue vertical launch capability sooner. While the initial costs are low, achieving full orbital launch capability by completing Phase 2 still requires a significant total investment (up to ~$30 million) and multiple years of political and public support. Ensuring that early successes translate into broad approval for rockets will require continuous stakeholder engagement and transparency. In short, this approach only works if the state is committed to following through on Phase 2 when the time comes, and if the community remains on board (Deloitte 2024; LegiScan 2025).

Option 4: Horizontal-Only Launch at PMRF (Kaua‘i)

Overview: Establish a horizontal launch and test facility at the Pacific Missile Range Facility (PMRF) on Kaua‘i, focusing on aircraft-like launch systems rather than vertical rockets. PMRF is a large Department of Defense range with an existing 6,000-foot runway (AirNav LLC 2025) and extensive restricted airspace over the ocean (CNIC Navy 2025). This option would involve upgrading PMRF's airfield (potentially lengthening or reinforcing the runway, adding taxiways), constructing hangars and integration facilities, and setting up a mission control center for aerospace operations. The facility would support horizontal takeoff systems such as spaceplanes carrying tourists or research payloads, air-launched rocket platforms, high-altitude pseudo-satellites (HAPS) like long-endurance drones or balloons (HAPS Alliance 2023), and hypersonic vehicle tests (U.S. Navy / MDA 2020). It

would not host any vertical rocket launches. Cost and timeline are to be determined (TBD) as they would depend on negotiations with the Navy and specific infrastructure needs, but significant federal coordination would be required (DoD 2021). The appeal of PMRF is its ready-made range safety infrastructure (radars, tracking, secure area) (Sandia National Laboratories 2024a) and clear over-water corridors that make even exotic flight tests safer.

Pros:

- Built-in range safety and security: PMRF already has controlled airspace, advanced tracking radars, and safety protocols for missile tests, which can greatly reduce the setup cost for a horizontal spaceport. The horizontal vehicles envisioned (like spaceplanes or drone swarms) generally have a lower risk profile to public safety than large rockets, and PMRF's isolation on West Kaua‘i with ocean on one side provides an added buffer (CNIC Navy 2025). This means many operations (drop tests, suborbital flights) could be done with minimal hazard to civilians (Sandia National Laboratories 2024b).

- Over-water launch/recovery routes: The site's geography allows aircraft or spaceplanes to take off and land over the Pacific, mitigating noise and risk to populated areas. For instance, a spaceplane could launch toward the ocean and return without flying over neighborhoods. This is attractive for testing hypersonic vehicles or HAPS, which might have debris or jettison stages – the ocean provides a safe dumping area (CNIC Navy 2025).

- Potential for defense-commercial synergy: PMRF's ongoing role in missile defense and hypersonic testing could dovetail with commercial uses (U.S. Navy / MDA 2020). By integrating a horizontal launch capability, there's an opportunity for collaboration between defense projects and private aerospace firms, e.g., sharing data or jointly developing flight test programs. Hawai‘i could market PMRF as a hub for cutting-edge aerospace innovation, leveraging the DoD's presence to attract companies that need secure testing grounds (DoD 2021).

Cons:

- Runway limitations: PMRF's existing runway (~6,000 ft) may be too short for larger spaceplanes or carrier aircraft to take off with heavy payloads (AirNav LLC 2025). Expanding the runway could be physically constrained by geography (the base is sandwiched between ocean and mountains) and environmental rules. Without upgrades, the range of vehicles that can operate is limited.

- Operational hurdles at a military base: Any commercial activity at PMRF would require a formal agreement with the Department of Defense (likely a Commercial Space Operations Support Agreement, (CSOSA) (Space Launch Delta 45 2017) and compliance with military security protocols. This can introduce restrictions – for example, civilian staff and visitors might need security clearances, and launches could be postponed if they interfere with military missions. The administrative complexity could deter some commercial players (DoD 2021).

- Need for new support infrastructure: While PMRF has a launch range, it lacks hangars, fuel facilities for aerospace planes, and dedicated telemetry for civilian launches (Sandia National Laboratories 2024a). Building these will increase cost and require navigating federal construction approvals. Environmental and cultural reviews would also be necessary, as even a horizontal site would need to assess impacts, e.g., noise, any runway extension's effect on shoreline or Hawai‘ian cultural sites (CNIC Navy 2025). Kaua‘i residents have historically been skeptical of space initiatives, so community outreach would still be important to address concerns about expanding the base's activities (Honolulu Civil Beat 2019).

Option 5: Vertical-Only Launch at PMRF (Kaua‘i)

Overview: Utilize PMRF on Kaua‘i as a vertical launch complex for rockets. This would involve adapting and upgrading the existing PMRF launch sites which have been used for suborbital sounding rockets and missile tests (Sandia National Laboratories 2024) into a facility capable of handling small orbital launch vehicles. Estimated cost is $15–25 million with a development time of 3–5 years (Deloitte 2024). PMRF is well-suited for launches to polar or high-inclination orbits because rockets can fly safely southward or westward over vast stretches of ocean (NASA 2022). It also can support suborbital launches, e.g., missile defense targets or scientific rockets (U.S. Air Force 2016). The base has some launch infrastructure history. For example, a small orbital rocket launch (ORS-4 mission) was conducted there in 2015 (U.S. Air Force 2016). Key assets include extensive instrumentation, secure facilities, and the largest instrumented ocean range in the world, providing excellent safety buffers with virtually no risk to civilian populations downrange (Hawai‘i Defense Economy n.d.).

Pros:

- Leverages existing defense range: PMRF already operates as a rocket range with secure perimeters, tracking radars, and range safety measures in place. This means much of the safety and telemetry infrastructure needed for launches is ready,

reducing what Hawai‘i would need to build. The military’s experience with launch operations adds a layer of expertise and rigor that can enhance safety and reliability (Sandia National Laboratories 2024).

- Ideal for polar and defense missions: The location on Kaua‘i’s west coast offers an unobstructed southward trajectory over the ocean, ideal for polar or sun-synchronous orbits commonly used by Earth observation satellites and many defense payloads (NASA 2022). There are essentially no inhabited landmasses directly south, which is a huge safety advantage. For defense or research missions that require secrecy or isolation, PMRF’s remote controlled environment is a strong plus (CNIC Navy 2025).

- Remote location minimizes public risk: West Kaua‘i is sparsely populated, and PMRF’s coastal launch pads have open ocean downrange, meaning even in worst-case scenarios (rocket failure), debris would fall into the sea far from communities. This can streamline certain environmental assessments and make launches more palatable from a public safety standpoint (CNIC Navy 2025).

Cons:

- Military priorities limit flexibility: PMRF is foremost a Navy missile test range, so any commercial launches would be secondary to military operations. Available launch windows could be infrequent and subject to change if a defense test needs the range. This scheduling uncertainty and inflexibility could deter commercial customers who need reliable access (DoD 2021).

- Trajectory and size constraints: While polar launches are feasible, some orbital trajectories (like due east for equatorial orbits) are not possible from Kaua‘i without overflying other islands or Asia, limiting the range of missions (NASA 2022). PMRF’s infrastructure was not designed for modern orbital rockets – it currently lacks on-site liquid propellant storage, high-capacity electrical power, and a heavyweight launch pad for larger commercial rockets. These deficiencies mean only smaller launch vehicles could be supported unless significant upgrades are made. Logistics are also challenging: Kaua‘i has no deep-water port nearby and roads with weight and height limited bridges, complicating the delivery of large rocket stages or fuels (Kaua‘i County 2023).

- Complex approvals and community concerns: Converting PMRF into a commercial spaceport would require negotiating a CSOSA with the Department of Defense and

obtaining approvals that have no clear precedent, since FAA licenses typically cover non-federal sites (Space Launch Delta 45 2017). It could be a lengthy bureaucratic process. Moreover, even though launches are offshore, community and cultural sensitivities on Kaua‘i remain. There may be opposition to any perceived expansion of military activities or risks to Kaua‘i’s environment (Honolulu Civil Beat 2019). Significant capital investment would be needed to make PMRF dual-use, and even then, it would remain constrained by the factors above, raising questions about the long-term commercial viability (DoD 2021).

Option 6: Hybrid Launch Complex at PMRF (Horizontal + Vertical)

Overview: Develop a dual-use launch complex at PMRF that supports both vertical rocket launches and horizontal aerospace operations. Essentially, this option combines Option 4 and Option 5 at the PMRF site to create a comprehensive Aerospace Port on Kaua‘i. That means extending PMRF’s capabilities to include a spaceplane runway and hangar area in addition to rocket pads. The concept takes advantage of PMRF’s large secure area and instrumentation, envisioning a “one-stop” facility where, for example, a company could test a reusable hypersonic vehicle (horizontal launch) and also launch small orbital rockets (vertical launch) from the same base. This would be a significant undertaking, likely the most complex on Kaua‘i, and cost is not fully estimated (TBD) but would exceed the single-mode options due to the need for both runway upgrades and pad construction (Deloitte 2024). The timeline is also TBD, with federal coordination playing a major role (DoD 2021).

Pros:

- Maximal use of federal infrastructure: By leveraging PMRF’s existing radar, telemetry, and safety systems, the state could save on duplicating these for a new site. The secure DoD infrastructure means highly sensitive projects (military or commercial) could be accommodated, and PMRF’s isolation provides unmatched safety for both vertical and horizontal flight paths (virtually no public exposure) (Sandia National Laboratories 2024a). A hybrid PMRF could host a wide range of vehicles – from balloons and drones to orbital rockets – offering broad technological flexibility to users (CNIC Navy 2025).

- Distributed impacts and synergies: Having both launch modes in one location could create operational synergies, such as shared mission control or fuel facilities, and allow missions that use both, e.g., a horizontal launch test followed by a vertical

launch to be coordinated efficiently. It also keeps all aerospace activity confined to one secure area versus impacting multiple islands. PMRF’s leadership has shown some openness to commercial partnerships as state land leases approach renewal in 2029, indicating potential willingness to collaborate (Honolulu Civil Beat 2025). If successful, this could position Hawai‘i as a unique site offering combined services not found elsewhere (FAA Office of Commercial Space Transportation 2025).

Cons:

- High complexity and federal dependency: As with Options 4 and 5, any commercial use of PMRF requires a CSOSA and DoD clearances, but a hybrid would likely be even more complicated to authorize (Space Launch Delta 45 2017). Right now, no such agreement exists, and creating one for a dual-use facility with both launch modes would involve uncharted regulatory waters. The Air Force/Space Force and Navy would need to be deeply involved, possibly slowing progress (DoD 2021).

- Significant infrastructure gaps: PMRF currently lacks the horizontal support infrastructure (no hangars or spaceplane facilities) and also has limitations for vertical operations (no liquid fuel farm, etc.), as noted (Sandia National Laboratories 2024b). A hybrid port would need major investments in both areas – e.g., runway extension or reinforcement for large carrier aircraft, construction of hangars and integration facilities, building a new launch pad or refurbishing an old one for orbital rockets, and upgrading utilities (power, communications) to support all this. This translates to higher costs and extensive federal environmental reviews (impact assessments for both runway projects and rocket pads) (Deloitte 2024).

- Operational and community hurdles remain: Even with horizontal launches being “lower impact,” combining them with rockets means all the noise, environmental, and safety concerns of both apply. West Kaua‘i’s community might object to an expansion of base activities on principle, and the notion of significantly increasing launches (up to the hundreds per year PMRF is authorized for) could raise alarm if not carefully managed (Honolulu Civil Beat 2025). Also, commercial use would always have to work around Navy testing schedules, which could limit the attractiveness of this ambitious option (DoD 2021).

Option 7: Horizontal-Only Launch on Lāna‘i

Overview: Create a horizontal launch and test range at Lāna‘i Airport on the island of Lāna‘i. This option would utilize Lāna‘i’s small airport (currently a 5,000-foot runway)

(Federal Aviation Administration n.d.) for AAM and UAV testing, drone launches, and potentially very small spaceplane operations. Lāna‘i is unique in that 98% of the island’s land is owned by a single private landowner, which could simplify arrangements for development and operations if that landowner is supportive (Pūlama Lāna‘i 2022). The estimated cost is around $5–10 million with a 2–3 year timeline. Investments would likely go toward modest airport upgrades – improving or extending runways and aprons, adding telemetry and communications gear, constructing a hangar or operations center, and mitigating any environmental hazards. The focus here would be on uncrewed aerial systems, advanced air mobility trials, and small suborbital vehicles (similar in spirit to Option 1’s activities but transposed to Lāna‘i).

Pros:

- Remote and controlled environment: Lāna‘i has a very small population (~3,300 residents) (U.S. Census Bureau 2023) and is relatively isolated, meaning tests could be conducted with minimal disturbance or risk to the public. The island’s quiet, low-traffic setting is ideal for experimental flights that might be too noisy or risky near larger communities.

- Single landowner advantage: With one major landowner (who also happens to strongly influence island policy), approvals and land leases could be streamlined if that stakeholder is on board. There’s no patchwork of owners to negotiate with, unlike many other locations. This could shorten the development timeline and reduce political complexity – essentially a “green light” from one entity could move the project forward quickly.

- Existing support infrastructure: Lāna‘i already has basic infrastructure such as Manele Harbor (for bringing in equipment by barge) and the airport itself. Supplies, fuel, and parts could be shipped to the island’s harbor and transported a short distance to the airport. While limited in scale, these facilities mean the island can logistically support a small aerospace operation without starting from zero. This option could carve out a niche for Lāna‘i as a specialized test hub for drones and AAM, tapping into a growing industry while largely avoiding impacts on the more populated islands.

Cons:

- Short runway constraint: Lāna‘i Airport’s runway is only about 5,000 feet long. This severely limits the size and weight of any aircraft or spaceplane that can operate. Large carrier jets or fully fueled spaceplanes simply cannot take off from such a short strip without major extension. Even many business jets require longer runways, so without lengthening the runway, activities would be restricted to small drones or light experimental craft. Extending the runway could be very difficult due to land contours and would likely raise environmental concerns (the airport is near the coast).

- Environmental contamination: Lāna‘i’s agricultural past (pineapple plantations) left a legacy of soil contamination, notably from DBCP pesticide residues (Dawson 1993). Any development would need to address this contamination – soil remediation and safety protocols would add cost and complexity. Disturbing the ground for construction to lengthen runways, build new structures, etc., could unearth hazardous materials that must be handled properly.

- Local opposition and policy barriers: Crucially, Lāna‘i’s community and leadership have signaled strong opposition to spaceport projects. The island’s official community plan explicitly “discourages the development of commercial spaceport facilities” (County of Maui 2021, reflecting concerns about preserving Lāna‘i’s quiet, rural character. Residents may fear noise, disruption, or precedent for larger projects. Gaining acceptance would be an uphill battle, and political representatives from Maui County (which includes Lāna‘i) have historically not supported such initiatives.

- Limited workforce and resources: With a small local population and virtually no existing aerospace industry on Lāna‘i, any specialized labor, equipment, or materials would have to be brought from off-island. This raises operational costs and logistic challenges for example staff housing and hardware/materials transportation. It also means the direct local economic benefits might be smaller, since many jobs or contracts could go to outside firms supplying the needs. All these factors make this option’s return on investment questionable unless a very specific use-case (like a dedicated drone test center) justifies the effort.

Option 8: Vertical-Only Launch on Lāna‘i

Overview: Construct a standalone vertical rocket launch site on Lāna‘i, in a remote coastal area away from Lāna‘i City. This would involve building a complete orbital launch complex

from the ground up – launch pad, flame trench, fuel and oxidizer storage, a control center, etc., likely on privately owned land on the island’s coast (County of Maui 2021). The vision is to use Lānaʻi’s geography (surrounded by ocean and lightly populated) to create a secure commercial spaceport for polar orbital launches (NASA 2022). The estimated cost is $15–50 million with a 3–6 year timeline, reflecting significant uncertainty depending on scale (smaller suborbital pad vs. larger orbital pad) (Deloitte 2024). This site would be civilian-run and not part of any military range. It could in theory support polar and some high-inclination orbits similar to what PMRF can (launching southward), but due to island alignment, true equatorial launches (due east) would not be possible without overflying other islands (NASA 2022).

Pros:

- Excellent safety buffers: A launch site on Lānaʻi’s coast would have open ocean in most directions, providing natural safety corridors. In case of a launch anomaly, debris would almost certainly fall into the sea rather than on land. With very few residents nearby, this location inherently minimizes risks to the public and could simplify range safety considerations (County of Maui 2021).

- Full civilian control: Because the land is privately owned and not on a federal facility, operations could be on flexible schedules without coordinating with military test calendars (Wikipedia 2025). This might appeal to commercial launch providers who want dedicated, on-demand launch windows. Also, companies desiring privacy or secrecy (for example, testing a new rocket) might value an exclusive site like Lānaʻi where they can operate away from crowded ranges (FAA Office of Commercial Space Transportation 2025).

- Constructability: Much of Lānaʻi’s coastal area consists of flat or gently sloping former pineapple fields with existing dirt roads. This means from an engineering perspective, building a pad and support facilities is feasible – the terrain is not rugged, and basic road access exists for bringing in construction equipment. With sufficient investment, a launch complex could be built to modern specs, and the remoteness offers room for all necessary safety clearances (County of Maui 2021).

Cons:

- Community and political opposition: This is perhaps the biggest hurdle. Lānaʻi’s community has strongly opposed prior spaceport ideas, and the island’s plan currently forbids such development (County of Maui 2021; Maui County Planning

Commission 2023). There are deep concerns about disrupting Lāna‘i’s way of life and the sanctity of the land. Culturally significant sites could be in the vicinity, raising the stakes for environmental and cultural impact assessments. Overcoming this opposition would require extensive engagement, and even then, political obstacles at the county level could block the project (Maui County Planning Commission 2023).

- Environmental hurdles: As with Option 7, soil contamination from past agriculture (DBCP and other chemicals) would need addressing during construction (State of Hawai‘i Department of Health 2023). Rocket launches could introduce issues like acid rain (from rocket exhaust) or potential impacts on nearby marine life if debris falls – these would be scrutinized by agencies (NOAA, EPA) especially given sensitive marine ecosystems around the island (The Aerospace Corporation 2022). Endangered species or cultural resources could also be present, requiring careful mitigation (County of Maui 2021).

- Trajectory limitations: Lāna‘i’s location means equatorial (due-east) launches are essentially infeasible – a rocket heading east would cross over Maui or the Big Island, which is not acceptable (NASA 2022). Thus, Lāna‘i could only serve polar or certain inclined orbits that head south or north, which significantly narrows its usefulness for many commercial missions.

- Logistical and cost challenges: Building and operating a spaceport on a small island is costly. All large hardware (rockets, propellants, cranes, etc.) would have to come in by barge or air, and the island’s small harbor might need upgrades to handle frequent heavy shipments (Hawai‘i Department of Transportation 2024). The infrastructure investment would be high for an entirely new range (communications, tracking systems, etc. all from scratch). There is also no precedent for a commercial orbital launch site on such a small island – regulatory authorities might be extra cautious, potentially leading to a very lengthy licensing process (FAA Office of Commercial Space Transportation 2025). In short, while technically possible, a Lāna‘i vertical spaceport faces steep logistical, financial, and social obstacles that make it a high-risk, high-cost endeavor (Deloitte 2024).

Option 9: Hybrid Launch Complex on Lāna‘i (Horizontal + Vertical)

Overview: Develop both a horizontal and a vertical launch capability on Lāna‘i, effectively combining Option 7 and Option 8 to turn the island into a comprehensive “space island” hub. This would mean upgrading Lāna‘i Airport for horizontal AAM/UAV operations and also

building a separate vertical launch pad on the island for orbital rockets. The investment required is the highest of any single-island approach – approximately $20–55 million over 3–6 years – because it involves two parallel projects: extending or improving the airport plus constructing a rocket range (Deloitte 2024). If achieved, Lāna‘i would uniquely host the full spectrum of aerospace activities, from drone testing and spaceplane launches to orbital rocket flights. The idea is that some companies or missions might benefit from an integrated site where they can do atmospheric tests and orbital launches in one locale, potentially sharing support infrastructure.

Pros:

- Widest range of capabilities: Lāna‘i could support everything from small drone experiments to launching satellites, a range no other single Hawai‘i site currently offers. This one-stop capability might attract companies looking for a place to perform end-to-end development: for instance, testing a rocket’s air-launch drop system at the airport and then conducting the orbital launch from the pad. The operational synergies (shared fuel storage, communications, personnel) could improve efficiency if managed well (FAA Office of Commercial Space Transportation 2025).

- Safety and scheduling freedom: The same benefits of Lāna‘i’s remoteness and private control apply here – both horizontal and vertical operations would have wide safety buffers and freedom from military scheduling conflicts (Wikipedia 2025). Over-ocean launch paths and a single landowner mean, on paper, an ideal controlled range for dual use. If fully realized, this could tap multiple market segments (commercial small sats, defense tests, AAM development, space tourism) and potentially yield a higher economic payoff in the long run by not “missing” any market that a single-mode site might (Tauri Group 2023).

Cons:

- Extremely complex & high impact: This option combines all challenges of Options 7 and 8 and then some. Coordinating two significant development projects (airport upgrade and new launch pad) simultaneously would be a massive undertaking for the state. It doubles the environmental and community impacts – both those associated with horizontal operations (noise, runway activity) and those of rocket launches (larger safety zones, more intense environmental scrutiny) would affect Lāna‘i. The island’s residents would likely see this as a fundamental transformation

of Lāna‘i’s character, prompting intense opposition (County of Maui 2021; Maui County Planning Commission 2023).

- Technical limitations remain: Even after heavy investment, Lāna‘i’s inherent constraints don’t disappear. The runway would still be relatively short unless dramatically extended (with all associated difficulties), limiting the size of horizontal launch vehicles (Hawai‘i Department of Transportation 2024). And the vertical launch trajectories would still exclude equatorial orbits due to neighboring islands (NASA 2022). So after spending the highest amount, Hawai‘i would get a very capable site but one that still couldn’t serve every mission profile. This raises the question of whether the benefits justify the costs (Deloitte 2024).

- Uncertain return on investment: Given the high cost and the risk that community or regulatory pressures could restrict operations, the ROI is highly uncertain. If local opposition imposes caps or delays, the site might never reach the launch cadence needed to pay off. Essentially, this path carries all the risks of doing a horizontal project in a sensitive area and a vertical project in a sensitive area, concurrently. It is the most ambitious and, by extension, the most challenging option with the greatest potential for setbacks (Tauri Group 2023).

Option 10: “No Build” (Status Quo)

Overview: Take no action toward establishing an Aerospace Port. This “option” means Hawai‘i would maintain the status quo with no new spaceport infrastructure and no significant expansion of aerospace launch activities. In the short term, this incurs no direct costs to the state and avoids any controversy or environmental disturbance since nothing new is built (Deloitte 2024). While not a development option per se, it’s included as a baseline to weigh the opportunity costs of inaction.

Pros:

- No immediate cost or risk: The state would spend $0 on spaceport development, eliminating financial risk. There would be no construction, so no chance of project delays, budget overruns, or unforeseen environmental issues. Hawai‘i’s communities would experience no new noise, safety hazards, or environmental impacts related to launches. For officials and residents wary of the idea, this option maintains the comfort of the familiar – focusing on other priorities without diving into a new industry that carries uncertainty (Deloitte 2024).

- No regulatory hurdles: By not pursuing a spaceport, Hawai‘i avoids the complex regulatory processes (FAA licensing, environmental impact statements, etc.) altogether. There’s also no need to navigate community consent or inter-agency coordination for aerospace activities. Essentially, all potential conflicts or challenges inherent in the other options are sidestepped with a no-build decision (FAA Office of Commercial Space Transportation 2025).

- Preserves current conditions: Culturally and environmentally, the no-build option means no changes to the landscape – sacred sites remain undisturbed, habitats unchanged, and there are no rocket sounds in the skies. For community members concerned about protecting Hawai‘i’s environment and heritage, this option guarantees that a spaceport will not introduce new pressures (County of Maui 2021).

Cons:

- Missed economic opportunities: By choosing not to act, Hawai‘i would forfeit all the potential benefits of the growing aerospace sector. This includes high-paying technical jobs that would have been created, workforce development in STEM fields for local youth, and business revenue from launch activities and related tourism (Tauri Group 2023; NASA n.d.). The state has unique advantages (geographic and infrastructural) that would remain untapped (NASA 2022). For example, small satellite companies looking for launch sites will continue to go elsewhere, and Hawai‘i would not see any of the launch fees or associated economic boost (BryceTech 2023).

- Lost strategic position: As other states and countries invest in spaceports and capture pieces of the NewSpace economy, Hawai‘i could fall behind and become reliant on external launch providers for any space initiatives (like putting University of Hawai‘i experiments into orbit). The state’s advantageous location for certain orbits would benefit others (competitors) instead of Hawai‘i itself (PwC 2025). In a decade’s time, when the aerospace market is much larger, Hawai‘i might regret not establishing a foothold early (Space Foundation 2025). Essentially, no-build is the safest path in the short term, but it sacrifices long-term strategic and economic gains. Hawai‘i would remain on the sidelines of an industry projected to expand rapidly in coming years (Space Foundation 2025).

Option X: Distributed Island Launch Network (Multi-Site Approach)

Overview: In addition to the ten primary options above, the study considered an alternative concept of a distributed launch and test network across multiple Hawai‘ian Islands. Instead of one central spaceport, this approach would coordinate several small-scale facilities on different islands, each specializing in certain activities. For example, PMRF on Kaua‘i could focus on defense-related suborbital tests (Sandia National Laboratories 2024), Hilo Airport on Hawai‘i Island could handle civilian horizontal launches and UAV work (State of Hawai‘i Department of Transportation 2025), perhaps South Point (Ka Lae) or another remote site for sounding rockets or high-altitude balloons (NOAA 2024), and even facilities outside the main islands like Johnston Atoll could be in the mix (Federal Register 2025). These would be linked under a central governance to share scheduling and resources. The emphasis is on versatility and using/upgrading existing sites rather than building a huge new complex. This network idea aims to reduce the impact on any single location by spreading out the activities (FAA 2023).

Pros:

- Reduced impact per community: Spreading launch activities across multiple islands means no single community bears all the burden. For instance, a few launches per year at four different modest sites might be more acceptable than 20 per year at one site. This could lower community resistance since each site sees limited, targeted use (and those sites can be chosen for low population and suitable geography) (NASA / ACTA Inc. 2012).

- Flexibility and resilience: A network allows for flexible scheduling – if weather or other issues prevent launching from one island, perhaps another is available. It also matches missions to the best site, e.g., using PMRF only for sensitive defense launches; using Hilo for commercial space flights. This specialization can promote innovation across various environments – mountain, sea-level, equatorial vs. polar orientations (NASA 2022). The approach also has resilience; operations aren’t all-or-nothing on one site, so maintenance or an incident at one location wouldn’t shut down Hawai‘i’s entire aerospace activity (FAA 2023).

- Builds on what exists: A distributed model leans on existing infrastructure – using what's already at PMRF, airports, etc., with smaller add-ons. This could mean faster implementation for certain low-impact tests (like balloon launches or drone races that might need minimal permitting). It might also open doors to partnerships with

local universities and research groups on each island, spreading economic and educational benefits more evenly (Tauri Group 2023).

Cons:

- High coordination complexity: Managing a multi-island aerospace range would be complex in terms of logistics and oversight. The state would need a strong central authority to coordinate airspace usage, safety procedures, and scheduling among all sites. There's also duplication of effort – each site might need its own telemetry station, safety crew, and support infrastructure, which can drive up overall costs even if each site is individually modest (Deloitte 2024).

- Regulatory and logistical hurdles: FAA licensing and federal regulations are currently geared toward single-site spaceports, not a web of sites. Pioneering a new multi-site license framework could lead to regulatory delays and uncertainty (FAA 2025). Moving rockets or propellants between islands introduces logistical challenges and safety risks by ship or plane (Hawai‘i State Department of Health n.d.). The lack of precedent for a distributed spaceport model in the U.S. could complicate federal approvals, as officials work out how to ensure safety across all the sites collectively (FAA 2023).

- Potential cost inefficiencies: While each site uses existing bases, having multiple sites means some loss of economies of scale – support teams might have to be duplicated, and infrastructure like radar or weather systems might be needed at each location if they are too far apart to share. Over time, maintaining several smaller facilities could be more expensive than one central spaceport, unless usage is kept very low (Deloitte 2024).

Across all options, one theme is clear: community trust and local benefit are at the center of success. Hawai‘i's history with aerospace and astronomy projects shows that even well-funded, technically sound proposals can falter if they do not earn public support and respect cultural values (Honolulu Civil Beat 2019). Many of the options above involve potential noise, environmental risks, or use of land with deep cultural significance. Engaging with residents, Native Hawai‘ian communities, and local leaders from the earliest stages is not optional – it is essential. Efforts such as forming a Community Advisory Board, conducting thorough Cultural Impact Assessments, and establishing workforce training programs with local institutions including the University of Hawai‘i are recommended to build transparency and show commitment to shared benefits (NASA / ACTA Inc. 2012). The

goal must be to ensure that Hawai‘i’s people see tangible advantages – quality jobs, educational opportunities for keiki (children), and investments in infrastructure – and that they have a voice in how an Aerospace Port develops (Tauri Group 2023).

Regardless of the chosen path, by prioritizing genuine community partnership and environmental stewardship, Hawai‘i can pursue an Aerospace Port in a way that honors the islands’ unique cultural and natural heritage. The payoff would be significant: a foothold in the burgeoning space economy, diversification of the local economy with high-tech jobs, and inspiration for the next generation of Hawai‘i’s scientists and engineers (Space Foundation 2025). Moving forward swiftly yet sensitively, Hawai‘i has the opportunity to become a key player in aerospace – on its own terms, with its communities as active partners in shaping that future (PwC 2025).

Table 4 provides a concise comparison (In the table, “H + V” denotes combined Horizontal + Vertical, and CSOSA refers to the agreement needed with DoD for commercial use of PMRF (Patrick Space Force Base 2017). All cost figures include a Hawai‘i cost premium (~20%) (CNN 2023) and are rough-order estimates pending detailed engineering (Deloitte 2024). “Demand Alignment” qualitatively notes which market sectors each option would serve well (High) vs. poorly (Med or Low) (Tauri Group 2023).

Table 4. Aerospace Port Development Options Overview – Cost, Timeline, Pros/Cons, Demand Fit

Option	Est. Cost	Time line	Key Benefits	Key Risks / Constraints	Demand Alignment
1. Horizontal-Only (Hilo – ITO)	$3–5M	1–2 yrs	Low cost; quick start; supports AAM/UAV; potential for air-launch ops	Limited to non-orbital initially; airport scheduling/noise constraints	High: AAM/UAV, NewSpace dev · Med: Defense (T&E)
2 · Vertical-Only (Hilo Private – Kea‘au)	$15–25M+	3–5 yrs	Equatorial access; private land control; modest pad footprint	Lava hazard zone; legacy soil contaminants; likely community opposition	High: Commercial/Launch · Med: Science
3. Phased Hybrid (Hilo - Vertical site)	$18–30M (phased)	2–5 yrs	Scalable; lowers early risk; builds community trust; flexible Phase-2 siting (PMRF/Kea‘au/Lāna‘i)	Higher coordination complexity; Phase-2 depends on Phase-1 momentum	High: All sectors

Option	Est. Cost	Time line	Key Benefits	Key Risks / Constraints	Demand Alignment
4 Horizontal Only (PMRF – Kaua‘i)	TBD	TBD	Uses DoD airspace/radar/safety; over-water corridors; lower public risk than vertical	Runway limits; CSOSA/security requirements; build hangars/telemetry/fueling; regulatory reviews	High: Defense/Test · Med: Commercial
5. Vertical-Only (PMRF – Kaua‘i)	$15–25M+	3–5 yrs	Range assets; secure facilities; extensive ocean safety buffers; polar/high-inclination access	Military scheduling conflicts; limited liquid-propellant infra; logistics bottlenecks; community concerns; CSOSA needed	High: Defense · Low: Equatorial Commercial
6. Hybrid (PMRF - H+V)	TBD	TBD	Secure DoD infrastructure; broad tech flexibility (rockets + spaceplanes/HAPS/hypersonic)	CSOSA/clearances; possible runway upgrades; new horizontal support; extensive federal environmental review	High: Defense/Test · Med: Commercial
7. Horizontal-Only (Lāna‘i Airport)	$5–10M	2–3 yrs	Private ownership; remote setting; leverage airport and harbor logistics	Short 5, 001-ft runway; DBCP contamination; community opposition; limited local workforce	Med: AAM/UAV · Low: NewSpace
8. Vertical-Only (Lāna‘i coastal)	$15–50M	3–6 yrs	Excellent ocean safety buffers; full civilian control/scheduling; buildable terrain/roads	Cultural opposition; environmental remediation; trajectory limits (equatorial infeasible); high logistics cost	Med: Science/Tech Demo · Low: Defense/Equatorial
9. Hybrid (Lāna‘i – H + V)	$20–55M	3–6 yrs	Full spectrum capability (UAV/AAM → orbital); potential synergies across modes	Most complex/high-impact; doubles community/environmental issues; runway still short; uncertain ROI	Med → High: AAM/NewSpace
10 · No Build (Status Quo)	$0	N/A	No immediate costs/impacts; preserves status quo	Lost economic/strategic growth; reliance on external spaceports; loss of market position	None
X. Distributed Network (Multi-Site, Coordinated)	$8–20M per site (scalable)	2–5 yrs (staged)	Spreads economic benefits across islands (jobs, suppliers, internships); lower per-site impact;	Higher coordination/licensing complexity; infrastructure	High: AAM/UAV, Defense/Test, NewSpace dev · Med: Orbital (as

Option	Est. Cost	Time line	Key Benefits	Key Risks / Constraints	Demand Alignment
			mission-to-site fit; weather/ops resilience	duplication; novel FAA pathway	pads come online)

Demand Alignment Legend: *High = well-serves that sector's needs; Med = partially serves; Low = poor fit or major limitations; T&E = Test & Evaluation.*

Option 3 (Phased Hybrid) emerges as a strong candidate by providing a balanced, stepwise path (and is recommended in this report's conclusions). Option 5 (Vertical at PMRF) and Option 2 (Vertical at Kea‘au) both satisfy core orbital launch demand but come with different trade-offs – federal range vs. community greenfield site – and could be candidates for Phase 2 if Phase 1 goes well. Option 1 (Hilo horizontal) is an excellent Phase 1 by itself but would need an eventual vertical component to fully meet market demand. No Build (10) is included for comparison but, given Hawai‘i's goals, is not the preferred choice. Option X (Distributed) would be a combination of others (e. g. smaller versions of 1, 5, 7 on multiple islands) – its evaluation is qualitatively discussed above and shares many of the same entries as the individual options, just distributed.

Hawai‘i has a spectrum of options from minimal to ambitious. The feasibility analysis favors starting modestly (to generate momentum and prove feasibility) while keeping the end goal in sight (orbital launch capability). The next section will delve into the economic and financial analysis, assuming one or more of these options is pursued, and examine how the project can be funded, what returns to expect, and how to maximize local economic benefits.

Economic Impact: Horizontal vs. Vertical Aerospace Launch Facilities in Hawai‘i

Horizontal Aerospace Launch Facilities

Estimated Capital Investment

The development of a horizontal launch site in Hawai‘i would leverage existing airport infrastructure, keeping upfront costs relatively low. For example, converting Hilo International Airport into a spaceport would require only minor upgrades (telemetry antennas, a hangar, safety systems) on the order of $3–5 million, with a timeline of about 1–2 years (Deloitte 2024; Federal Aviation Administration Office of Commercial Space Transportation 2025). This minimal capital outlay is feasible because the 9,800-foot

runway, control tower, radar, and other facilities are already in place (State of Hawai‘i Department of Transportation 2025; AirNav LLC 2025). By comparison, Spaceport Cornwall in the UK, is a geographically remote horizontal-launch site analogous to Hawai‘i. This facility invested approximately £20 million (~$25 million USD at 2023 rates) for runway and systems upgrades to enable small satellite launch by carrier aircraft (Browne 2023). In the U.S. mainland, several spaceports including Mojave Air and Space Port in California and the Midland Air & Space Port in Texas followed a similar model of repurposing airport runways, avoiding the need for large new infrastructure builds (Mojave Air and Space Port n.d.; Midland Development Corporation 2024). While Cornwall invested a significant amount, a Hawai‘i based horizontal launch facility would likely fall on the lower end of the cost spectrum (few million dollars) if the sate sticks with the strategy of “convert, not construct.” Any estimates for development should include a Hawai‘i cost premium of ~20% for construction in these estimates, recognizing that building even modest facilities in Hawai‘i tends to be pricier than on the mainland due to higher shipping and labor costs (U.S. Bureau of Economic Analysis 2024; Deloitte 2024). Even with that premium, the required capital investment for a basic horizontal spaceport is an order of magnitude smaller than for a dedicated vertical launch complex.

Construction Phase Impact (Direct & Indirect Jobs)

Because the horizontal spaceport concept involves modest construction, the job creation during the build-out is relatively limited but still beneficial for the local economy. With a capital project of ~$5 million, one can expect on the order of a few dozen construction jobs at peak (Deloitte 2024). In the Hilo ITO conversion scenario, local contractors would be employed to install equipment and refurbish facilities over the short 1–2 year construction period. For context, building a new small launch pad (around $24 million in 2010 dollars) in Kodiak, Alaska was projected to support about 80 total jobs (direct + indirect over a multi-year construction phase) (Anchorage Economic Development Corporation 2010). Scaling that down to a ~$5 million project suggests roughly 20–30 direct construction jobs and a similar number of indirect jobs (with suppliers, transport, lodging, etc.), for a total on the order of 40–60 jobs supported during construction (Anchorage Economic Development Corporation 2010; U.S. Bureau of Economic Analysis 2024). The use of primarily local labor and materials (to the extent possible) means money spent will circulate in Hawai‘i’s economy. We estimate the total payroll from the construction phase of a horizontal facility to be on the order of $3 million (RIMS II wage data; U.S. Bureau of Economic Analysis 2024). (By comparison, the Kodiak project’s analysis indicated about $15 million in labor income from a $24 million project (Anchorage Economic Development Corporation 2010). A

smaller Hawai‘i project would proportionally generate a few million in wages, much of it likely going to island-based workers.) This short-term infusion of construction spending would have indirect ripple effects, e.g., in equipment rental companies, inter-island shipping, and local service businesses would see upticks in demand. While construction of a horizontal launch site is not a massive works project, it can temporarily create dozens of jobs (with a mix of construction trades, engineers, and technicians) and inject a few million dollars in wages into the local economy, helping to justify the public investment.

Operational Phase Impact (Ongoing Jobs and Income)

Once operational, a horizontal aerospace port in Hawai‘i would generate sustained employment in both direct roles and supporting sectors. These impacts can be benchmarked against similar horizontal-launch facilities:

- **Direct on-site jobs**: These include spaceport operations staff (range safety officers, airfield managers, technicians), aerospace company employees (engineers, vehicle technicians for launch systems, UAV/AAM/UAM test operators), and administrative/support personnel. For example, a modest horizontal port could start with 40–55 direct jobs and grow as activity ramps up (Tauri Group 2023; Federal Aviation Administration Office of Commercial Space Transportation 2025). Spaceport Cornwall (horizontal-only) offers a useful analogue: it is expected to support roughly 150 direct jobs at full capacity (projected at full build-out) (University of Exeter 2023). Hawai‘i’s horizontal port might begin at the lower end (dozens of employees) focused on suborbital launch services, UAV testing, and maintenance, but could expand toward the 100+ direct jobs range if new aerospace tenants such as spaceplane companies and drone developers set up operations.
- **Indirect and induced jobs**: The presence of an Aerospace Port would spur additional employment in the local economy. Indirect jobs would arise at fuel suppliers, maintenance contractors, local engineering firms, and other vendors serving the spaceport and its users. Induced jobs emerge as employees spend their salaries in the community (housing, retail, food, etc.). Notionally, every direct aerospace job can support roughly ~1.5 additional jobs in the region, based on multiplier effects observed elsewhere (U.S. Bureau of Economic Analysis 2024). At Spaceport America (NM) in 2022, for example, 811 total jobs were supported by the 548 direct aerospace jobs . This is a multiplier of about 1.48 (Cook 2023). Using a similar multiplier, 50 direct jobs in Hawai‘i might translate to on the order of 75–100 total jobs including indirect and induced employment (U.S. Bureau of Economic

Analysis 2024). These would include roles like local hoteliers and caterers (serving visiting launch crews and tourists), transportation providers (for hauling equipment or offering helicopter range safety services), and a variety of technical consulting gigs that crop up around an aerospace hub.

- **Annual wages and income**: The jobs created by a horizontal launch facility are expected to be highly skilled and well-paid. Aerospace engineering and technician roles typically command strong salaries; even support roles at a spaceport (firefighters, ground crews, IT staff) often pay above median wage due to the specialized nature of the work. As a concrete benchmark, Alaska's Kodiak spaceport in one year supported 155 jobs paying $7.7 million in wages (this is 2009 data; wages are likely higher today) (Alaska Aerospace Development Corporation 2009). If a Hawai‘i horizontal spaceport were to sustain ~80 total jobs (direct and indirect), one could expect on the order of $4–5 million in annual labor income flowing to Hawai‘i workers (author's calculation using $60–80k average wage; U.S. Bureau of Economic Analysis 2024). This includes both the salaries of spaceport staff and the wages of employees working at local businesses that benefit from the spaceport's operations. These figures would scale with activity: if launch cadence and tenant activity increase, so would employment and income. For instance, Mojave Air and Space Port in California now hosts over 60 aerospace companies; its operations contribute over $100 million annually to the local economy (Guzzetti 2022), illustrating the upper-end potential when a horizontal launch site becomes a magnet for industry. Indeed Hawai‘i's market is smaller, however, a successful horizontal port could realistically generate tens of millions of dollars per year in economic output once fully developed. One could expect a significant portion would accrue as wages to local residents.

The operational phase of a horizontal launch facility might start with a few dozen direct jobs (perhaps ~$3–4 million in direct wages) and grow toward a hundred or more jobs over time. Including multiplier effects, the total ongoing employment attributable to the facility could reach into the low hundreds in a high-growth scenario, with annual household income on the order of $5–10 million or more being supported in the regional economy.

Return on Investment (ROI) Projections

Short-term (near-term) ROI: In purely financial terms, a horizontal spaceport should not be expected to recoup its capital investment immediately through operating revenue. Launch fees, hangar rentals, and other income streams at comparable spaceports are

relatively modest in the early years. Industry analyses and government audits have noted that launch fees alone rarely repay capital costs quickly. For example, Spaceport America's user fees and rents totaled only about $7.5 million in 2022 (Cook 2023), against over $220 million invested in its construction (Prokop 2023).

In the beginning, a Hawai‘ian horizontal port would more than likely operate at a deliberate loss financially, requiring state support for operations and debt service until activity picks up. However, it is important to know the ROI in the early years is primarily realized in economic stimulus, not profit. Notionally, the construction phase would inject money into the local economy. This would be an immediate return on investment via jobs and tax revenues. In this broader sense, the state's investment yields returns in the form of jobs created, local vendor contracts, and groundwork laid for a new industry cluster. Virginia's Commercial Spaceport (Wallops/MARS), for example, estimates about $3 in economic output for every $1 of public money spent on the spaceport – an ROI measured in statewide growth rather than direct payback (Virginia Commercial Space Flight Authority 2023). Hawai‘i can expect a similar pattern: short-term ROI will come via high-skilled employment, diversification of the tourism-dependent economy, and enhanced R&D capacity in the islands, even if the facility itself operates at a deficit initially.

Long-term ROI: Over a longer horizon (say 5–15 years), a successful horizontal launch facility would move toward self-sufficiency and even net positive financial return, especially if it evolves as a multi-use aerospace hub. A key advantage of the development of a horizontal facility -especially at Hilo- is flexibility; a horizontal site can host varied revenue-generating activities (small satellite launches, space tourism flights, UAV testing ranges, AAM demonstrations, etc.). This diversification boosts utilization and revenue streams. With a moderate launch cadence and steady tenant leases, it is feasible that a Hawai‘i'an horizontal launch facility could approach an operational breakeven where annual revenues cover annual costs. Any "profit" beyond that would effectively come in the form of economic spillover: for example, out-of-state launch campaigns bringing dollars to Hawai‘i for fuel, lodging, and services. In a scenario where the horizontal port becomes a niche player in the global aerospace market (serving, say, Pacific region launches and drone development), the state's initial investment of a few million could yield substantial multiples in economic activity. As noted, Alaska's modest state seed funding of ~$20–25 million in Kodiak helped attract over $230 million in federal and private spending by 2010 – a long-term leverage of about 9:1 (Alaska Office of Management and Budget 2010). Hawai‘i's ROI may similarly be measured in strategic terms: securing a foothold in a trillion-dollar commercial space industry and reducing reliance on mainland launch providers. Additionally, intangible returns accumulate over time: a pipeline of STEM education and

workforce development (inspiring local youth into aerospace careers), and potential federal missions or grants that would not come to Hawai‘i at all without such a facility.

The horizontal spaceport is not a get-rich-quick venture for the state – the short-term ROI is mainly in economic stimulus and positioning for the future, rather than direct payback. However, long-term returns could be significant if the facility ramps up: the operation can become self-sustaining and catalyze a new sector of the economy. Importantly, by starting small (low cost) the state limits its risk; if the market grows, the ROI accelerates via expansion, and if not, the sunk cost was comparatively low (a prudent approach echoed by experts). The strategic return of even a break-even horizontal port is considerable: Hawai‘i would have established itself as an aerospace player in the Pacific, which can have follow-on benefits not easily captured in an ROI ratio (such as national security value and innovation spillovers).

(Notes: Job figures are approximate, based on analogues like Spaceport Cornwall and Hilo projections (University of Exeter 2023). “Indirect & induced” includes jobs in the supply chain and those supported by employees’ spending. Labor income for construction is total over the short construction period, while for operations it is an annual figure. A Hawai‘i cost adjustment (~20% higher costs) is factored into the investment and thus into these impact estimates.)

Vertical Space Launch Facility (Pad-Based Orbital Launch Site)

Estimated Capital Investment

Developing a vertical rocket launch site in Hawai‘i entails a significantly higher capital investment than a horizontal facility. Such a project would require constructing a dedicated launch pad with flame trench, blockhouse or control center, fuel storage facilities, integration hangars, lightning protection, range instrumentation (radar/telemetry), and safety infrastructure including fire suppression, blast berms, etc. (The Aerospace Corporation 2022).

A recent assessment for Hawai‘i estimated the cost for a modest orbital launch pad at roughly $15–25 million (not including any Hawaii-specific cost premium) (Deloitte 2024; Alaska Aerospace Corporation 2021). This aligns with experiences at other isolated small spaceports: the Pacific Spaceport Complex–Alaska (PSCA) in Kodiak was initially built in the late 1990s for about $20–30 million (state-funded) and has required additional investments over time (Alaska Aerospace Corporation 2021; Alaska Office of Management and Budget 2010).

It is anticipated that in Hawai‘i, after accounting for higher construction costs (~20% uplift for island logistics), a similar small vertical launch facility could cost on the order of $20–30 million to become operational (U.S. Bureau of Economic Analysis 2024; Deloitte 2024). This figure is for a basic single-pad spaceport designed for small orbital rockets (light-lift vehicles). Larger-class launch facilities can be far more expensive; for example, Virginia’s Mid-Atlantic Regional Spaceport (MARS) built a pad for medium rockets (Antares) at a cost of about $120 million (Virginia Commercial Space Flight Authority 2023; NASA Wallops Flight Facility 2022). However, Hawai‘i’s scale and market (small satellite launches, possibly <500 kg to orbit class vehicles) point to the lower end of the cost range (BryceTech 2024).

It’s worth noting that partnering with existing infrastructure could alter the needs: if the site were to be developed at the Navy’s Pacific Missile Range Facility (PMRF) on Kaua‘i, costs would be lower because some range support and security infrastructure already exists (potentially reducing new capital needs) (U.S. Navy and Missile Defense Agency 2020; Sandia National Laboratories 2024). Conversely, a greenfield site on private land (like the proposed location near Hilo, Hawai‘i Island) would bear the full cost of new construction but offers more operational flexibility (PISCES 2019; Alaska Aerospace Corporation and Federal Aviation Administration 2019).

It is estimated ~$25 million (±$5M) is a reasonable ballpark for establishing a basic vertical launchport in Hawai‘i, with the understanding that exact costs depend on site-specific conditions (terrain, environmental mitigations, utility extensions) and that Hawai‘i’s isolation adds a premium in materials and labor costs (Deloitte 2024; U.S. Bureau of Economic Analysis 2024).

Construction Phase Impact (Direct & Indirect Jobs)

Building a vertical launch facility would provide a larger (though still temporary) boost to employment. The development of a vertical launch facility is a larger and more complex project than the development of a horizontal launch facility. The construction phase is expected to span several years (estimated 2–3 years for a single-pad complex) (Tauri Group 2023; Deloitte 2024), employing a wide range of workers: civil engineers, heavy equipment operators (for grading and concrete work), electricians and plumbers (for pad systems and utilities), specialists for assembling launch hardware, and general labor (The Aerospace Corporation 2022). Drawing from analogues:

- **Direct construction jobs**: For a project in the ~$20–30 million range, one could expect on the order of 50 or more full-time equivalent construction jobs on-site during the peak of building activity (Deloitte 2024; Anchorage Economic Development Corporation 2010). This is consistent with projections from similar projects; for instance, when Rocket Lab built a new pad at Wallops, Virginia, in 2019, it was expected to create around 30 construction jobs for that smaller-scale pad (Rocket Lab USA 2018; SpaceNews 2018). A larger effort in Hawai‘i with multiple facilities built concurrently would employ even more workers. In Alaska, construction related to expanding launch capabilities was analyzed to support dozens of direct jobs annually over the build period (Anchorage Economic Development Corporation 2010). We estimate roughly 50 direct jobs (annual average) could be sustained during the core construction phase of a Hawai‘i vertical launch pad, including both local construction crews and some specialized contractors brought in from outside for unique tasks like installing launch mount systems or tracking radar (author’s scaling from Anchorage Economic Development Corporation 2010 and Rocket Lab USA 2018; Deloitte 2024).
- **Indirect/induced jobs**: Vertical launch facility construction would spur additional employment off-site. These indirect jobs include roles like material suppliers for cement, steel, rocket fueling systems (some local procurement and some from mainland), transportation and shipping jobs (moving large components to the island, perhaps via harbor), and professional services (such as environmental consultants, architects, safety inspectors). Moreover, induced jobs would arise as construction workers spend their income locally (housing rentals, restaurants, retail). Given Hawai‘i’s strong local unions and supply networks for construction, a good portion of the spending would remain in-state, though some leakage occurs for high-tech components sourced from the mainland. A multiplier analysis suggests the indirect+induced jobs could add roughly another 50–80 jobs during the construction phase (U.S. Bureau of Economic Analysis 2024). For example, an economic study of a Kodiak launch pad project indicated ~80 total jobs (direct plus indirect) supported over the construction period (Anchorage Economic Development Corporation 2010). In Hawai‘i, using a slightly lower multiplier (to account for imported materials), we might see on the order of 30 indirect jobs supporting the ~50 direct construction roles, totaling ~80 jobs at peak (author’s adjustment using Hawai‘i-specific RIMS II multipliers; U.S. Bureau of Economic Analysis 2024).

- **Construction wages and income**: The labor income from the construction phase of a vertical launch site is significant. Taking the Alaska example: ~80 total construction-related jobs over ~2 years translated to about $15 million in payroll injected into the economy (Anchorage Economic Development Corporation 2010). In Hawai‘i, we anticipate a similar magnitude. If ~50 direct workers earn, say, $70–80k on average (construction wages in Hawai‘i are relatively high), that’s around $4 million per year in direct wages; over 2–3 years, perhaps $10+ million in direct payroll (author’s estimate using Hawai‘i construction wage data; U.S. Bureau of Economic Analysis 2024). Including indirect jobs (often in sectors with slightly lower wages), the total labor income during construction could reach ~$15–20 million across the project. This is a substantial short-term economic stimulus. Local construction firms, in particular, would benefit – many millions would be spent on contracts for site prep, concrete pouring, electrical work, fencing, etc., supporting not just workers but also business profits and state tax revenues.

Operational Phase Impact (Ongoing Jobs and Income)

Once the vertical launch facility is built and active, the employment profile shifts to a smaller steady-state staff punctuated by periodic surges around launch campaigns. Key points on operational impacts:

- **Direct permanent jobs**: A vertical spaceport typically has a lean permanent workforce when launch cadence is low. Core staff might include range safety officers, launch pad technicians, engineers, facility maintenance crews, security personnel, and administrative staff. Based on analogous facilities, we expect on the order of 20–30 direct full-time jobs in the initial operating years (Tauri Group 2023; Rocket Lab USA 2019). For instance, Rocket Lab’s Launch Complex 2 at Wallops was slated to have about 30 day-to-day operational jobs at the start (Rocket Lab USA 2019; SpaceNews 2018). Similarly, Alaska’s Kodiak spaceport employs a small number of full-time staff (public reports suggest only a few dozen) and then scales up manpower during launches by bringing in experts from Anchorage or other locations (Alaska Public Media 2022). In Hawai‘i, initial operations might be infrequent (perhaps a handful of launches per year), so the core team can be relatively small. However, as launch frequency increases, direct staffing would grow. Rocket Lab’s site provides a clear analog: ~30 direct workers for a low cadence, with plans to scale up to ~100 direct jobs if launches become more frequent (Rocket Lab USA 2019). We can foresee a scenario where Hawai‘i’s vertical port, if successful, supports 50–100 direct jobs in the long run – particularly if multiple launch

companies operate from the site or if value-added services like payload processing or manufacturing co-locate there (Deloitte 2024; BryceTech 2024).

- **Launch campaign workforce**: In addition to the permanent staff, each vertical facility launch would bring a surge of activity. Launch vehicle companies would likely fly in teams of engineers and specialists to prepare and execute the launch. These teams can number anywhere from 10–50 people per launch for small rockets while larger rockets might involve 100+ (The Aerospace Corporation 2022). While many of these are not permanent Hawai‘i residents, their presence does create short-term local employment for support services and some may eventually station employees locally. For example, a small orbital launch might require local fuel truck operators, crane operators, range instrumentation staff, etc., hired on a per-launch contract. While these roles are transient, the spaceport could foster a cadre of local contractors who support launches much like how Kodiak has Aurora Launch Services to provide labor on demand (Alaska Aerospace Corporation 2021). Over time, if launch frequency is steady, some of these roles effectively become permanent or rotating positions in the community.
- **Indirect and induced jobs**: A vertical launch site’s operations will stimulate a network of indirect jobs in the region. These include suppliers and logistics providers such as companies providing cryogenic gases, machine shops fabricating custom parts, tug and barge services delivering stages or fuel to the island. Also, hospitality and retail benefit from visiting launch teams and, potentially, spectators or space tourists. Induced effects arise as the spaceport employees (who earn high salaries) spend money locally, supporting everything from real estate to restaurants. With initially ~30 direct jobs, one might expect another ~20–30 indirect/induced jobs to be supported, assuming a multiplier of ~1.5 (U.S. Bureau of Economic Analysis 2024). In a high-operation scenario (100 direct jobs), total jobs could reach ~150–180 including second-order effects. As a concrete reference, Wallops Island’s aerospace cluster which includes the MARS spaceport supports many hundreds of jobs in the region when including indirect roles, although that also counts NASA activities (Virginia Commercial Space Flight Authority 2023). For a smaller Hawai‘i operation, we estimate roughly 1 additional job for every direct job once the ecosystem matures with launch contractors, range maintenance, local businesses catering to the spaceport meaning 50 direct jobs might sustain ~100 total jobs in the regional economy (author’s scaling from Virginia Commercial Space Flight Authority 2023 and U.S. Bureau of Economic Analysis 2024).

- **Annual wages and income**: The direct jobs at a vertical launch facility are generally high-wage positions. Rocket propulsion and launch operations are specialized fields; technicians and engineers in this sector often earn well above the national average. If we take a conservative average of ~$80,000 for the skilled direct jobs, then 30 direct employees would generate about $2.4 million in direct annual wages (author’s estimate using Hawai‘i-adjusted wage data; U.S. Bureau of Economic Analysis 2024). Indirect jobs may have a lower average wage (say $40k–$60k, including roles in logistics or services). If ~20 indirect jobs average $50k, that’s another $1.0 million in wages. Thus, in early operations, the vertical launch site might yield on the order of $3–4 million per year in local labor income. As activity scales up, these numbers grow proportionally. At 100 direct jobs (perhaps $8 million in direct wages) and, say, 60 indirect jobs (~$3 million in wages), the total could be $10–12 million in annual payroll circulating in the Hawai‘i economy. To gauge higher-end possibilities, note that Spaceport America’s 2022 operations supported $46 million in labor income statewide (New Mexico Spaceport Authority 2023) – but that corresponds to a much larger 800+ workforce including a major space tourism company. Hawai‘i’s vertical port would likely operate on a smaller scale; nonetheless, a successful operation could certainly reach eight-figure annual income impacts over time. Another perspective: In Alaska, during a year with an active launch, the Kodiak facility was responsible for 11% of total earnings in the local borough (Anchorage Economic Development Corporation 2010). This is a reminder that even a relatively small number of very well-paid jobs can make a outsized difference in a remote or rural economy. In Hawai‘i, the effect would depend on the island – on the Big Island or Kaua‘i, a cluster of 50–100 aerospace jobs (with salaries often double the island’s median wage) would significantly boost average household incomes and create demand for skilled labor.

The operational phase of a vertical launch facility in Hawai‘i might start modestly, but if the launch cadence increases and additional aerospace firms establish a presence, it could grow to a few hundred total jobs (direct and indirect) and on the order of $10+ million in annual income for Hawai‘i residents.

(Notes: Job and income estimates are based on analogues such as Rocket Lab’s Wallops pad (30 direct jobs start) (Rocket Lab USA 2019) and Kodiak’s reported impacts (Alaska Public Media 2022; Anchorage Economic Development Corporation 2010). Construction labor income is cumulative for the entire build period (2–3 years). Operational figures assume a light launch cadence initially; a higher frequency of launches would proportionally increase staffing and local spending. All costs include an estimated Hawai‘i

cost premium of ~20%, which slightly reduces local job multipliers since more specialized inputs might be imported. Nonetheless, federal contracts or launch customers would bring outside dollars into Hawai‘i, enhancing the net economic benefit.)

Return on Investment (ROI) Projections

Short-term ROI: A vertical launch facility is a significant capital undertaking with longer payback period and higher risk. In the short term, the revenue streams (launch fees, range service charges, site leases) will likely be modest in the initial years. This is especially true if launch rate is low (perhaps a few launches annually) (U.S. Government Accountability Office 2021). For example, a small launch might bring in on the order of $100k–$200k in range fees to the spaceport, which is not substantial compared to multi-million annual operating costs (U.S. Government Accountability Office 2021; Federal Aviation Administration Office of Commercial Space Transportation 2025). In this case, Hawai‘i would almost certainly need to subsidize operations initially (as do other states with spaceports) (U.S. Government Accountability Office 2021).

The short-term ROI is primarily expected to be realized through the construction spending (as discussed) and the immediate jobs created, plus strategic positioning. It’s important to note that if launch frequency remains very low, the direct financial ROI could remain negative indefinitely. Kodiak’s spaceport, for example, had some years with only one launch (or none), requiring continued state support to maintain readiness (Alaska Public Media 2022). Alaska Aerospace Corp. has had to justify its existence through military contracts and broader economic impact rather than per-launch profits (Cryopolitics 2024; Alaska Aerospace Corporation 2021).

Hawai‘i officials should carefully consider the following: In the short run, vertical launch facility infrastructure investment is akin to investing in the construction of a highway or harbor; an investment that enables economic activity but doesn’t “make money” by itself immediately. The initial ROI would be intangible or indirect: new aerospace companies would come to Hawai‘i because the launch site exists, local talent would be trained for high-tech jobs, and federal dollars would flow in for launches/tests that would otherwise happen elsewhere. For instance, the presence of Kodiak’s pad eventually attracted missile defense tests and other federal missions, effectively bringing tens of millions in outside investment that wouldn’t have reached Alaska otherwise (Cryopolitics 2024; Anchorage Economic Development Corporation 2010). In ROI terms, these are benefits that don’t show up as profit to the spaceport operator but do justify the public investment by broader metrics.

Long-term ROI: The long-term return on a vertical spaceport can be substantial if a sustainable launch cadence and client base is achieved. There are a few pathways to positive long-term ROI:

- **Economic leverage**: As noted earlier, Alaska's initial ~$25 million investment led to over $230 million in facilities and launch business over the following decade (Anchorage Economic Development Corporation 2010). This roughly 9:1 leverage is one way to view ROI: every public dollar attracted nine more from federal agencies and commercial firms (Anchorage Economic Development Corporation 2010). Hawai‘i could seek a similar outcome by aggressively pursuing partnerships, encouraging the U.S. Space Force or NASA to use the site for specialized missions (U.S. Space Force 2024). The ROI here is measured in total capital attracted and spent in-state. If Hawai‘i's site can host, say, a series of DoD launch tests or become a base for a private launch company, those partners might invest in site upgrades themselves or pay user fees that offset costs over time (Cryopolitics 2024).
- **Operational break-even and revenue**: Achieving a high launch rate (for a small launch site, this might be 10–12 launches per year) would generate steadier revenue. Coupled with diversified uses like offering the site for hypersonic tests, sounding rockets, or even tourist suborbital flights, the spaceport could approach operational breakeven within perhaps 5–10 years (U.S. Government Accountability Office 2021). The FAA and GAO have observed that no commercial spaceport has purely run on launch fees without other support, but many aim for a mix of revenue sources – launch fees, lease income from tenants, fuel/service sales, and event hosting – to cover operating expenses (U.S. Government Accountability Office 2021; Federal Aviation Administration Office of Commercial Space Transportation 2025). If Hawai‘i's vertical port reaches self-sufficiency, the ROI in a narrow sense (annual revenues vs. annual costs) would be 1:1 at that point. Beyond that, any surplus or reduction in subsidies can be seen as a financial return.
- **Wider economic and societal returns**: Long-term, the ROI of a spaceport should factor in the economic growth it stimulates. Virginia's spaceport, for example, has been credited with boosting the Wallops Island region's economy by supporting thousands of jobs when counting everything (NASA, contractors, etc.) (Virginia Spaceport Authority 2023). In New Mexico, Spaceport America's recent impact report emphasizes the hundreds of jobs and tens of millions in value-added it generates annually (New Mexico Spaceport Authority 2023). These are "returns" to the state in terms of GDP and tax revenue. Hawai‘i could expect increased tax

receipts from any new industry activity – income taxes from new high-paying jobs, business taxes from aerospace firms, and even tourism taxes if launches draw visitors. The state's return on investment, in this broader view, might be calculated by an input-output analysis: for instance, if the spaceport yields $50 million/year in new economic output a decade from now (not implausible if multiple launches and R&D activities are happening), that is a real return on the initial $25 million outlay. Virginia Space Authority cites roughly a 3:1 output-to-investment impact, which if achieved in Hawai‘i would mean every dollar the state put in eventually generates three dollars of economic activity locally (Virginia Spaceport Authority 2023).

In evaluating ROI, Hawai'i decision makers must be sure to acknowledge risks as well as upsides: if launches do not materialize (due to market downturns or community opposition), the ROI could remain low. To buffer this risk, a phased approach should be considered (start horizontal or small, then expand). Starting small and scaling up accordingly will help to limit exposure and improve ROI over time (Deloitte 2024). On the bright side, if things go well, a vertical port can become a profit center. For example, Spaceport America is now regularly hosting launches and even space tourism flights, contributing $239 million in economic output in 2024 (New Mexico State University Arrowhead Center 2025) – a level that, if maintained, will eventually outweigh the initial costs in broader economic terms.

For Hawai‘i, a realistic outlook is that a vertical launch facility's short-term ROI is primarily in economic stimulus and strategic value, with the financial break-even or payback being a long-term prospect (possibly 15–20+ years). The investment secures Hawai‘i a place at the table in the space industry, and over time, that can yield dividends in jobs, innovation, and reputational prestige (making Hawai‘i known for more than tourism). Policymakers should consider those long-term, big-picture returns when deciding on the project, since a narrow profit-loss analysis in the early years will not capture the true value being generated.

(Notes: ROI projections draw on phased development recommendations and analogues like Kodiak's military contracts (Cryopolitics 2024; Anchorage Economic Development Corporation 2010) and Spaceport America's revenue diversification (New Mexico Spaceport Authority 2023; New Mexico State University Arrowhead Center 2025). Short-term subsidies are common per GAO analysis (U.S. Government Accountability Office 2021). All figures incorporate Hawai‘i-specific multipliers and a ~20% cost premium (U.S. Bureau of Economic Analysis 2024; Deloitte 2024).)

Broader Economic and Workforce Impacts: Building a Statewide Aerospace Ecosystem

Beyond the direct and indirect jobs created by an Aerospace Port itself -regardless of the chosen path forward (horizontal, vertical, or hybrid), the establishment of an Aerospace facility of any kind would catalyze workforce development opportunities across a broader ecosystem of supporting industries (NASA n.d.; Tauri Group 2023). It will be necessary to compliment core aerospace roles (launch technicians, range safety officers) are with IT/cybersecurity, advanced manufacturing, automation/robotics, and renewable energy positions, creating diverse career pathways and supporting economic diversification beyond tourism and agriculture (McKinsey & Company & World Economic Forum 2024; Tauri Group 2023). University programs and partnerships with DoD/industry would likely then anchor internships, apprenticeships, and upskilling aligned to local hiring commitments (NASA 2024; University of Hawai‘i Space Flight Laboratory 2024; NASA / ACTA Inc. 2012).

Potential Funding Models for Hawai’i

Financing the development of a vertical space launch facility in the state of Hawai’i will likely involve a mix of public and private funding similar to the analog sites discussed above. Several funding models were evaluated (see Table 5) ranging from fully state-funded to fully private, with hybrids in between. Given Hawai‘i’s public interest in oversight (due to cultural and environmental stakes) and the hesitance of private investors to bear all risk for a new site, a publicly owned, publicly funded infrastructure with private operations under lease seems the most viable start. This is akin to the model at Alaska’s Pacific Spaceport (Kodiak) and Virginia’s Mid-Atlantic Regional Spaceport (MARS) at Wallops, where the state built the pad and then companies pay to use it (Alaska Aerospace Corp. 2021; Virginia Spaceport Authority 2024). In Hawai‘i’s case, HTDC (or a new Spaceport Authority) could own the core facilities, using state bonds or appropriations (potentially General Obligation bonds) for capital costs (Hawai‘i State Legislature 2025). The state could seek a federal Space Transportation Infrastructure Matching (STIM) grant (if reauthorized by Congress) to cover perhaps as much as 50% of initial costs (FAA 2023).

Additional capital could come from DoD or NASA if the site serves their needs, e.g., a grant for dual-use launch capability (NASA 2024). On the private side, anchor tenants could contribute via long-term pad leases or upfront payments—for example, if a launch company commits to Hawai‘i, it might invest in specific infrastructure (its own integration

hangar or launcher equipment) (Tauri Group 2023). Another viable mechanism is issuing revenue bonds through something like Space Florida's model—the bonds are paid back by lease fees and user charges over time (Space Florida 2025). Table 5 outlines three potential models: (A) State-Funded & Tenant-Operated, (B) Private Concession, and (C) a Hybrid Grant/Lease approach. The recommended approach at this stage is Model A (state builds, owns, and controls initial site; contracts out operations as needed), because it ensures public control and can incorporate local values in operations. As the venture matures and proves profitable, the state could consider privatizing certain operations or engaging in a concession for expansion phases—but initially, public support is crucial to get it off the ground (Deloitte 2024).

Table 5. Potential Funding and Partnership Models for Hawai‘i Aerospace Port

Model	Description	Real-World Examples & Notes
A. State-Funded & Tenant-Operated (Public Ownership)	The State (via HTDC or a new Spaceport Authority) finances and owns the core infrastructure (launch pad, control center, etc.). Private launch operators then lease facilities or pay per launch to use them. State covers capital costs and possibly initial operating costs; private firms handle launch operations under agreements. *Revenue:* Launch fees, fuel/service fees, lease payments flow to state to offset costs.	Pacific Spaceport Complex Alaska (PSCA) – Kodiak, Alaska: Built with state funds, facilities owned by state corp (AAC); companies pay per launch. The Mid-Atlantic Regional Spaceport (MARS) at Wallops (VA): Gov't-owned range, used by commercial and research launches for fees. Pros: State retains control (can enforce safety, cultural protocols); ensures public interest (e. g. prioritizing local hiring). Can tap public financing (bonds, grants). Cons: State bears financial risk if launch volume is low; requires annual budget support until break-even.
B. Private Concession (Build-Operate) (Private Ownership/Operation)	A private entity (company or consortium) finances, builds, and operates the spaceport under a long-term concession or lease from the state. They may pay a concession fee or revenue share to the state. Essentially a public-private partnership where the private side handles most capital and operations,	Spaceport America (NM): State built it, but operations are run by a private contractor; also Virgin Galactic built its own facilities – a partial concession model. International airports (some): Private operators run airport under concession, investing capital and sharing revenue.

Model	Description	Real-World Examples & Notes
	seeking profit from users. State's role is mainly regulatory and perhaps land provision.	Pros: Shifts capital burden and operational costs to private sector; state's financial exposure is low. If a major aerospace company is interested, they could bring expertise and $$. Cons: Unlikely unless a big anchor tenant is committed – private investors will demand high return or guarantees. State loses some control (must ensure compliance with local priorities via contract). Profit motive might conflict with community objectives if not carefully structured.
C. Hybrid (Grants + Leases) (Mixed Funding)	Blend of public funds (state + federal grants) with private investment via leases or special funding arrangements. For example, state secures an FAA STIM grant covering 50% of infrastructure, state matches 25%, and a launch company invests the remaining 25% in exchange for reduced fees or exclusive pad rights for X years. Also includes creative financing: revenue bonds backed by launch fees, DoD co-funding for dual-use capability, landowner in-kind contributions (e. g. land at low cost from Shipman in exchange for revenue share).	Space Florida model: Uses state-backed bonds and loans to build facilities, then leases to SpaceX, Blue Origin, etc., recouping costs over time. Proposed Hawai‘i hybrid: FAA grant (if available) + state funds + private lease commitments. For instance, W. H. Shipman (landowner at Kea‘au) might lease land at low rate to state in return for jobs/equity stake. Or DoD could fund a piece if it guarantees launch access. Pros: Spreads cost and risk; ensures private "skin in the game" (through lease or co-investment) without making them bear all risk. Leverages federal money (which doesn't need payback). Cons: More complex to organize; requires securing grants (competitive) and firm commitments from private partners early. Needs clear agreements to avoid confusion in roles.

No single model fits all stages: Hawai‘i might start with a (public-led) and evolve to hybrid models as operations stabilize (Deloitte 2024). The key to successful development is

maintaining public oversight in the early years and ensuring alignment with Hawai‘i’s public interests (cultural/environmental safeguards, workforce development) while also attracting private partners to eventually scale up (Tauri Group 2023). Policymakers can begin by looking at enabling legislation, e.g., liability protection laws for spaceflight; also creating enterprise zones for the Aerospace Port which can improve the business case and lure partners (more on policy in Recommendations) (Hawai‘i Department of Business, Economic Development & Tourism 2025; LegiScan 2025).

Partnership Funding Examples

Mixed public–federal–private model: Both the Mid-Atlantic Regional Spaceport (MARS), operated by the Virginia Spaceport Authority and located at the NASA Wallops Flight Facility (WFF) on Wallops Island, Virginia and the Pacific Spaceport Complex – Alaska (PSCA), owned and operated by the Alaska Aerospace Corporation on Kodiak Island, Alaska (AK), utilized mixes of state capital, federal agency participation (NASA/DoD), and industry contributions for development funding (FAA 2023; Alaska Aerospace Corp. 2021; NASA Wallops Flight Facility 2022). At the MARS facility, state appropriations were paired with NASA range assets and tenant investments (BryceTech 2024). At the Kodiak facility, state capital expenditures were complemented by substantial federal infrastructure spending (GAO 2020). In 2014, a pad rebuild was funded via insurance—limiting new public outlays for that repair cycle (Alaska Aerospace Corp. 2015).

Outside infrastructure requirements: For the development of the MARS facility at Wallops, dock/channel dredging was required so that the site would be able to receive large components by sea. A Virginia budget amendment (HB1600) provided funds for Wallops-area dredging; and local reporting on the Sloop Gut dredge application by Virginia Port Authority & Rocket Lab (Virginia General Assembly 2025; Shore Daily News 2025; U.S. Army Corps of Engineers 2025).

The development of the facility at Kodiak required road, power/telecom extensions, and site-access upgrades to support heavy logistics to Narrow Cape (Alaska Aerospace Corp. 2021; GAO 2020). These investments functioned as dual-use community assets, e.g., better roads in Kodiak; deeper port access at Wallops (Alaska Aerospace Corp. 2021; GAO 2020).

Strategic Advantages of Hawai‘i’s Trade and Economic Zones

Economic Zone Designations Supporting the Aerospace Port

In addition to regulatory and environmental permitting, the land-use context for the Aerospace Port is strengthened by key economic zone designations that apply to the Island of Hawai‘i. These include the Foreign-Trade Zone (FTZ) designation at multiple sites (Foreign-Trade Zones Board n.d.), the federal HUBZone (Historically Underutilized Business Zone) designation that covers the entire island (U.S. Small Business Administration 2025), and the state Enterprise Zones (EZ) program (Hawai‘i Department of Business, Economic Development & Tourism 2025). While HUBZone benefits are island-wide and accessible to SBA-certified businesses (U.S. Small Business Administration 2025), FTZ and EZ incentives typically require site-specific validation and application (Foreign-Trade Zones Board n.d.; Hawai‘i Department of Business, Economic Development & Tourism 2025). Early coordination with program administrators is essential to confirm activation status and facilitate the application process for Aerospace Port users (Hawai‘i Department of Business, Economic Development & Tourism 2025).

Foreign-Trade Zone (FTZ) Benefits

Hawai‘i Foreign-Trade Zone No. 9 encompasses multiple sites across the islands, including a 31-acre parcel adjacent to Hilo International Airport and another at the Natural Energy Laboratory of Hawai‘i Authority (NELHA) near Kona Airport (Foreign-Trade Zones Board n.d.). This designation allows companies to import, store, assemble, and export products with deferred or eliminated customs duties, applied only upon entry into U.S. commerce or not at all if re-exported (Foreign-Trade Zones Board n.d.). For Aerospace Port tenants, these benefits reduce costs for importing rocket parts, satellite hardware, and ground support systems, while supporting efficient logistics for launch vehicle transport and component staging (Foreign-Trade Zones Board n.d.). The proximity to runways and fuel infrastructure at Hilo enhances these advantages (State of Hawai‘i Department of Transportation 2025). Businesses may also pursue FTZ subzone status to extend benefits beyond current boundaries, accommodating facilities near but outside designated areas (Foreign-Trade Zones Board n.d.).

HUBZone Designation and Federal Contracting Incentives

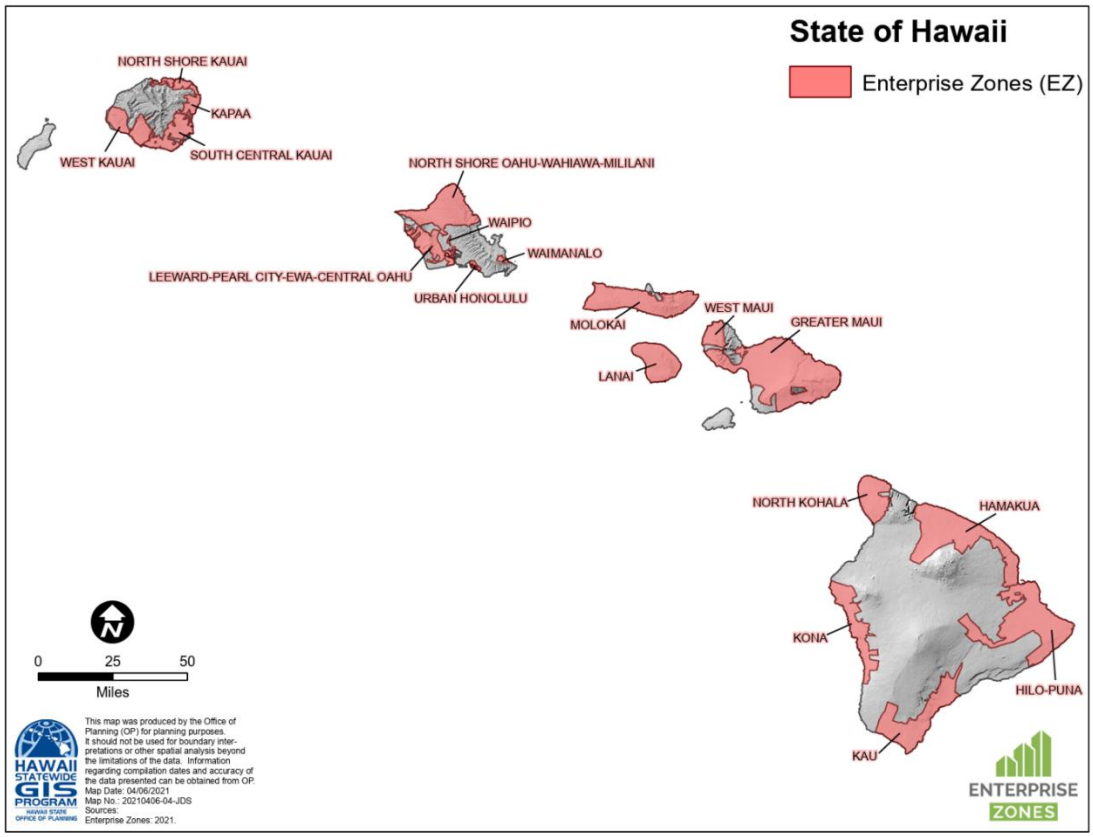
Many parts of Hawai‘i, including the Island of Hawai‘i, qualify as HUBZones, providing small businesses with access to federal contract set-asides and a 10 percent evaluation

price preference (U.S. Small Business Administration 2025). Aerospace suppliers, logistics providers, and firms in construction or IT supporting the Port can obtain HUBZone certification if they meet criteria such as location, employee residency, and U.S. ownership (U.S. Small Business Administration 2025). This enables competitive bidding on federal contracts, such as those for satellite telemetry or component testing (U.S. Small Business Administration 2025). Large Aerospace contractors may seek HUBZone partners to fulfill subcontracting goals, fostering a local ecosystem (U.S. Small Business Administration 2025). Certification through the Small Business Administration is required to leverage these opportunities (U.S. Small Business Administration 2025).

HUBZone and Enterprise Zone Coverage on Hawai‘i Island
Source: U.S. Small Business Administration 2025; Hawai‘i Department of Business, Economic Development & Tourism 2025.

The Hawai‘i Enterprise Zones Program provides tax and regulatory incentives for businesses in designated areas, including the Hilo–Puna zone (Hawai‘i Department of Business, Economic Development & Tourism 2025). Eligible Aerospace activities ;such as repair, maintenance, manufacturing, and logistics ;can receive a 100 percent state income tax exemption for up to seven years, General Excise Tax exemptions, and county-level

benefits like expedited permitting or property tax adjustments, provided they meet job creation and operational requirements (Hawai‘i Department of Business, Economic Development & Tourism 2025). For instance, a launch vehicle maintenance facility or satellite integration hub hiring locally could qualify for significant savings, enhancing investment viability and supporting a high-tech sector in the region (Hawai‘i Department of Business, Economic Development & Tourism 2025).



Foreign-Trade Zone No. 9 and Aerospace Port Concept Areas
Source: Foreign-Trade Zones Board n.d.; Hawai‘i Department of Business, Economic Development & Tourism 2025.

Together, these designations of FTZ, HUBZone, and EZ enhance the Aerospace Port’s appeal by reducing costs, streamlining supply chains, and improving access to federal contracts (Foreign-Trade Zones Board n.d.) U.S. Small Business Administration 2025; Hawai‘i Department of Business, Economic Development & Tourism 2025). Each program involves a distinct application process: FTZ through the U.S. Foreign-Trade Zones Board and Hawai‘i DBEDT (Foreign-Trade Zones Board n.d.), HUBZone via the SBA (U.S. Small Business Administration 2025), and EZ through DBEDT in coordination with county

governments (Hawai‘i Department of Business, Economic Development & Tourism 2025). Proactive engagement with these agencies will ensure tenants can maximize benefits (Hawai‘i Department of Business, Economic Development & Tourism 2025).

Community & Cultural Sensitivity

Past aerospace initiatives in Hawai‘i have faltered due to insufficient community engagement, underscoring the need for a deliberate, inclusive approach from the outset (Honolulu Civil Beat 2019; Kubota 2019; McNarie 2019). Meetings with HDoT, PISCES, and UH HSFL in June–July 2025 revealed that while approximately 80% of Hilo residents, including elders, supported prior spaceport concepts, a vocal minority successfully mobilized opposition through media and protests, citing concerns over jobs, environmental impact, and lack of tangible benefits (Kubota 2019; Honolulu Civil Beat 2019). To avoid repeating these failures, the following principles must guide development:

Secure a local champion: Identify a respected community leader or kūpuna capable of articulating economic and educational opportunities to build trust and consensus (NASA / ACTA Inc. 2012).

Prioritize Measurable Local Benefits

Guarantee internships, priority hiring for Native Hawai‘ians and Big Island residents, and partnerships with workforce programs. HDoT and PISCES emphasized that job creation is the primary path to community buy-in ;without firm commitments, opposition is inevitable (Tauri Group 2023).

Align with cultural and practical values: Focus on dual-use technologies that address community priorities, such as solar-powered drones for fire detection, environmental monitoring, rural internet, and sea-level rise surveillance. Avoid solid propellants due to pollution concerns; emphasize transparency in all operations (Haber and Lamoreaux 2012).

Support Youth Education and Inspiration

Partner with local organizations including Vibrant Hawai‘i, Hawai‘i Science & Technology Museum (HSTM), Ohana Kilo Hōkū, and 1st Nations Rocket Launch to foster STEM interest and long-term workforce pipelines (NASA 2024).

Engage early and often

Conduct regular town halls, leverage legislative presence at community meetings, and ensure no single voice is perceived as speaking for all of Hawai‘i. PISCES recommends

outreach to key figures such as Christian Wong, Kelly Ching, Dr. Luke Flynn, and Benson Medina (County Research and Workforce Development) for guidance (PISCES 2019).

Facility Requirements

Core Aerospace Port Infrastructure Needs

To support the envisioned operations, the Hawai‘i Aerospace Port will require several core infrastructure elements, some existing and some to be constructed. Horizontal launch site options prioritize leveraging existing FAA-certified infrastructure at Hilo International Airport (ITO) for horizontal launches and Advanced Air Mobility (AAM)/Unmanned Aerial Vehicle (UAV) operations (State of Hawai‘i Department of Transportation, Airports Division 2025; AirNav LLC 2025), and/or implementing dual-use capabilities at the Pacific Missile Range Facility (PMRF) on Kaua‘i (Sandia National Laboratories 2024). It is worth noting, the Hilo Airport option aligns with HDoT's clear preference for Hilo as the primary commercial entry point, emphasizing its runway, harbor, and land availability (State of Hawai‘i Department of Transportation, Airports Division 2025), while utilizing PMRF for defense-aligned testing and hybrid operations under CSOSA agreements (DoD 2021). Vertical launches are explicitly excluded from airport sites per HDoT guidance, reserving them for dedicated off-airport pads, perhaps in later phases (State of Hawai‘i Department of Transportation, Airports Division 2025).

Horizontal Launch Facility Requirements

According to According to FAA licensing guidance and GAO analysis, converting select Hawai‘i sites into horizontal launch facilities requires only targeted infrastructure upgrades ;communications, runway reinforcement, and hangar space ;estimated at $3–5 million for Hilo (Federal Aviation Administration 2024; GAO 2020; Deloitte 2024). This enables rapid entry for air-launched rockets, suborbital spaceplanes, and reusable vehicles, aligning with the phased strategy to build community trust through low-impact operations.

Key candidate sites include:

- Hilo International Airport (ITO, Big Island): With its 9,800 ft primary runway, FAA tower, and adjacent deep-water harbor ideal for carrier aircraft and logistics (AirNav LLC 2025; State of Hawai‘i Department of Transportation, Airports Division 2025; State of Hawai‘i Department of Transportation, Harbors Division 2025). A modest launch control suite with real-time telemetry links ;like the mission control rooms at Ellington Field–Houston Spaceport (Greater Houston Partnership) or the Telemetry & Monitoring room at Oklahoma Air & Space Port (Federal Aviation Administration)

would satisfy FAA range safety requirements without major tower changes (Greater Houston Partnership 2024; Federal Aviation Administration 2023; Federal Aviation Administration 2024). Limited pavement strengthening and an optional overrun extension (mirroring Mojave's 12,500 ft high-speed strip and Oklahoma's 13,503 ft runway with 1,000 ft overruns provide margin for spaceplane ops (Mojave Air and Space Port 2025; Federal Aviation Administration n.d.). One high-bay hangar or retrofit of an existing structure supports vehicle integration, as demonstrated by Mojave's purpose-built aerospace hangars and Midland's renovation for XCOR's Lynx spaceplane (Boom Supersonic 2025; Howell 2014).

- Notes on Site Preparation

  - Soil near Hilo Airport has historical arsenic contamination from past industrial activities. Encapsulation or targeted remediation will be required for any ground-disturbing work, potentially adding $0.5–1 million to development costs, as detailed in the 2020 Environmental Assessment for the Hilo Scrap Metal Yard (Hawai‘i Department of Health, Hazard Evaluation & Emergency Response Office 2007). This step ensures compliance with HEPA and NEPA while minimizing environmental risks (Hawai‘i State Department of Health n.d.; Federal Aviation Administration 2024).

  - Stakeholder consultations confirm that no Environmental Assessment (EA) is required under HEPA or NEPA, as minimal infrastructure upgrades are needed and no significant environmental impacts are anticipated (Hawai‘i State Department of Health n.d.; Federal Aviation Administration 2024). This streamlines FAA site operator licensing (14 CFR Part 420) to 6–12 months, focusing on airspace coordination via Letters of Agreement (LOAs) with existing ATC (Code of Federal Regulations 2025; Federal Aviation Administration 2024). Vertical launches in Phase 2 would trigger a full EA or EIS, necessitating early coordination with FAA AST, OHA, and DLNR for cultural and ecological reviews (Hawai‘i State Department of Health n.d.; Federal Aviation Administration 2024). Overall, alignment with CSLA and HRS Chapter 343 ensures compliance while accelerating market entry (Federal Aviation Administration n.d.; Hawai‘i State Department of Health n.d.).
  - Pacific Missile Range Facility (PMRF, Kaua‘i): A strategic site for dual-use horizontal operations, leveraging its existing instrumented over-water ranges and DoD infrastructure for commercial-military partnerships, e.g., via CSOSA agreements (Sandia National Laboratories 2024; U.S. Department of Defense 2021). While not FAA-certified for full commercial ops, targeted upgrades such as telemetry-

hardened control suites and reinforced aprons could enable air-launch testing with minimal new construction (~$2–4 million) (Deloitte 2024). PMRF's proximity to secure ocean corridors supports low-risk trajectories, with hangar retrofits drawing from existing missile integration facilities (Sandia National Laboratories 2024).

AAM/UAV Facility Requirements

UAVs, eVTOLs, and Advanced Air Mobility (AAM) vehicles require dedicated vertiport infrastructure integrated with airport runways and aprons to support testing, staging, and commercial ops. Hawai‘i’s island geography favors sites at Hilo for broad commercial entry and PMRF for defense-aligned activities, enabling inter-island shuttles, e.g., electric air taxis and drone deliveries while tying into the Airports Modernization Program (State of Hawai‘i Department of Transportation 2025). Facility planning must accommodate forecasted usage: daily UAV/AAM flights, monthly horizontal missions, and scalable vertical integrations. Dual-use designs at these sites ensure cost efficiency.

Core requirements would include:

- Vertiport Infrastructure: FAA-compliant pads (per Advisory Circular 150/5300–13B) with 100–200 ft clear zones for vertical takeoff/landing, including charging stations for electric propulsion (high-power EV infrastructure, 1–5 MW draw) and hydrogen refueling for hybrid eVTOLs (Federal Aviation Administration 2022). Weather-protected bays for sensor calibration and pre-flight testing, with modular fencing for noise mitigation. At Hilo, integrate with existing aprons for urban demand; PMRF's secure ranges suit high-fidelity UAV swarms (Sandia National Laboratories 2024).

- Runway and Apron Integration: Reinforced surfaces for mixed ops (UAVs, AAM, horizontal launches), with designated zones for rotorcraft, fixed-wing drones, and support vehicles. Hilo’s length supports carrier aircraft drops, while PMRF’s instrumented areas enable precise trajectory testing. Include LOX-safe ground handling and jet fuel storage for hybrid systems like Fenix Space (Fenix Space, Inc. n.d.; NASA Armstrong Flight Research Center 2022).

- Ground Control and Connectivity: Dedicated stations with low-latency fiber optics and RF spectrum for telemetry/control, leveraging existing ATC via Letters of Agreement (LOAs) (Federal Aviation Administration 2024). High-bandwidth links support real-time drone swarms or eVTOL traffic management, with solar microgrids

for resilient power ;critical for PMRF's remote ops (Sandia National Laboratories 2024).

- Capacity Scaling: Start with 5–10 daily ops at Hilo, expandable via modular bays; PMRF adds 2–5 defense-focused slots. Economic tie-ins include partnerships with operators like Joby Aviation (recent Pacific demos) or Regency Craft for seaglider networks, fostering tourism and logistics (Joby Aviation 2025; Smart Cities Dive 2025).

An AAM/UAV/UAM focus would position Hawai‘i as an early adopter, with vertiports generating revenue through leases and spurring STEM jobs (Tauri Group 2023).

Vertical Launch Facility Requirements

To support vertical rocket launches in Hawai‘i, a range of specialized facilities and services are required. Below is a structured summary of the key infrastructure elements that are likely to be needed, each with a brief description:

- Launch Pads: A dedicated vertical launch pad with a robust concrete pad or mount, equipped with flame deflectors/trenches and a water deluge system for sound suppression and fire control (The Aerospace Corporation 2022; Christian 2021). Multiple lightning protection towers are installed around the pad to shield rockets from strikes (The Aerospace Corporation 2022). The pad area is secured within a safety perimeter (keep-out zone), with public access strictly controlled during launch operations to keep spectators at a safe distance (Federal Aviation Administration 2024).

- Launch Control Center (LCC): A centralized launch control facility is essential for managing countdown and flight operations. It is typically located at a safe standoff distance from the pad (often on the order of miles for safety) and houses mission control consoles, communications links, and range safety systems (The Aerospace Corporation 2022). From this protected control center, engineers and range safety officers monitor the rocket’s telemetry, issue commands, and coordinate with airspace authorities. For example, Pacific Spaceport Complex Alaska (PSCA) uses an up-range control center nearly 2 miles from its pads to oversee launches, with tracking and telemetry equipment integrated on-site (Alaska Aerospace Corp. 2021).

- Telemetry and Tracking Systems: Even small launch vehicles require ground tracking and telemetry infrastructure to monitor the rocket's trajectory in real time and, if necessary, initiate flight termination for safety (Federal Aviation Administration 2024). This includes tracking radars and telemetry receiver antennas positioned for clear line-of-sight to the launch trajectory. The systems feed live data on vehicle position, speed, and engine performance back to the control center (The Aerospace Corporation 2022). Often, Portable or fixed Range Safety and Telemetry System (RSTS) units are deployed, and an optical tracking camera may be added for visual coverage. These assets ensure range safety by maintaining communication with the rocket throughout ascent and enabling the transmission of a destruct command if the vehicle goes off course (NASA n.d.).

- Integration and Assembly Facilities: Rockets and their payloads must be assembled, tested, and readied for launch in suitable facilities. A Vehicle Integration Building or hangar (often called a Horizontal Integration Facility for small launchers) is needed to allow for final assembly of stages and mating of payloads in a controlled environment. This high-bay facility should accommodate the full length of the launch vehicle (often assembled or transported horizontally) and include equipment like overhead cranes for lifting and stacking components. A dedicated Payload Processing Facility (PPF) with cleanroom bays is also required for satellite customers – this allows payload fueling, inspections, and fairing encapsulation under clean conditions. For instance, many spaceports provide PPFs featuring cleanrooms and safety systems for handling volatile propellants (hypergolics) needed to prepare satellites (The Aerospace Corporation 2022; NASA n.d.) Together, these integration facilities ensure the launch vehicle and its payload are safely prepared and tested before moving to the pad (The Aerospace Corporation 2022).

- Safety and Firefighting: Robust safety infrastructure is critical. This includes on-site fire suppression systems (such as water tanks, pumps, hydrants/monitors around the pad) and emergency response equipment and personnel on standby during each launch. Many launch sites build a dedicated Fire Station or Fire Response Facility just outside the launch hazard zone to house firefighting crews and equipment. During launch operations, specialized Aircraft Rescue and Firefighting (ARFF) vehicles or industrial fire trucks are pre-positioned near the pad, and medical first responders are on standby. These resources are trained for the unique hazards of rocket propellants. For example, the Pacific Spaceport Complex Alaska's master plan calls for a new fire station with its own power, water, and communication links,

ensuring rapid response capability separate from the main pad area (Alaska Aerospace Corp. 2021). Coordination with local fire departments and range safety officials is also established to handle any contingencies (Federal Aviation Administration 2024).

- Road Access: Reliable road infrastructure is required to transport rockets, fuel tankers, and heavy equipment to and from the launch site. The launch pad in Hawai‘i will need upgraded access roads engineered for heavy loads and all-weather conditions. Existing plantation or utility roads may require widening, grading, and paving to support frequent truck traffic and to prevent washouts in the tropical climate. Safe routing is essential: for instance, Spaceport America had to construct and improve roads to ensure all-weather access to its remote vertical launch areas (Spaceport America Master Plan 2025). Access roads often double as utility corridors, carrying power lines, fiber optics, and water pipes out to the pad. These roads will need to be gated and access-controlled, since only authorized vehicles and personnel should enter the launch complex (The Aerospace Corporation 2022).

- Utilities: The site must be equipped with reliable utilities, including electricity, water, and communications. Extending commercial power lines to the pad and support facilities is usually necessary, along with backup power systems (diesel generators or uninterruptible power supplies) to maintain critical systems during grid outages. Ample water supply is needed for both personnel use and technical purposes: pad deluge systems (which dump tens of thousands of gallons for sound suppression and cooling during launch), fire suppression, equipment cooling, and possibly for onsite laboratories. If municipal water is not nearby, wells or water storage tanks must be installed. High-bandwidth communications infrastructure is fundamental as well – typically fiber optic cables are laid to connect the launch site, control center, telemetry sites, and other nodes (The Aerospace Corporation 2022).

- Logistics and Storage: Proper storage and handling facilities are required for rocket propellants and other hazardous materials. Vertical launch sites typically have propellant storage farms – dedicated, bermed areas with bulk tanks for liquid fuels such as RP-1 kerosene and oxidizers (liquid oxygen, etc.), as well as magazines for solid rocket motors. These storage areas must be designed with safety in mind: they must be spaced out according to explosive safety distance guidelines and equipped with leak detection, fire suppression, and blast deflection features. For example,

many launch complexes include earthen-covered bunkers or berms that serve as fuel depots to isolate and protect stored propellants (The Aerospace Corporation 2022). In addition to propellant storage, the Aerospace port will need general warehouse space for storing spare parts, tools, and ground support equipment. Climate-controlled storage is important for certain components (and some small rockets can even be horizontally integrated inside modified storage bunkers for safety). Finally, staging areas should be designated for incoming shipments – A Hawai‘i site could utilize Hilo Harbor for sea delivery of large rocket stages or propellant shipments, with trucks then transporting these to the spaceport (State of Hawai‘i Department of Transportation, Harbors Division 2025). Overall, substantial storage and logistics infrastructure is required to safely manage the materials and hardware a launch operation needs (The Aerospace Corporation 2022).

- Lodging and Personnel Support: A vertical launch campaign can bring an influx of specialized staff (launch engineers, technicians, range safety officials, customer teams) for periods of days or weeks. In remote launch sites, spaceport operators often provide on-site crew quarters or nearby lodging to accommodate these personnel. One advantage of the proposed Hawai‘i location is its proximity to Hilo – a city with existing hotels and amenities – meaning off-base lodging can support most needs. Unlike isolated sites such as Kodiak, Alaska (where the launch complex is ~45 miles from the nearest town), a Hilo-area spaceport would not require dedicated housing facilities for staff (Alaska Aerospace Corp. 2021). Nonetheless, the site should include a small administrative building or operations support center for day-to-day personnel activities. This could host offices, meeting rooms, a mission briefing center and amenities for the launch crews. In the long term, the state might consider a visitor viewing area or outreach center as part of this facility, balancing public interest with security. But initially, leveraging local infrastructure for lodging and focusing on core operational support (office space, break areas, etc.) is the most practical approach (The Aerospace Corporation 2022).

- Range Communications: A range communication network is mandatory to link all elements of the launch range and ensure real-time coordination. This involves dedicated voice and data communication loops connecting the launch pad, control center, tracking stations, and external agencies (like FAA Air Traffic Control and military range assets). High-speed fiber optic links are typically used for primary connectivity, supplemented by microwave or radio links for redundancy. The communications system must support mission-critical voice channels (often called

“voice nets” or countdown nets) for different teams (engineering, safety, FAA, etc.), as well as telemetry and video data streams. In practice, new spaceports may partner with existing range providers for some of these services – for example, Spaceport America ties into White Sands Missile Range’s radar, telemetry, and weather systems for its launches (Spaceport America Master Plan 2025). Hawai‘i’s launch site would set up similar interfaces if using Pacific military range support, or it would deploy its own radar and data links. All communication infrastructure is hardened against outages, with backup power and redundant paths, since maintaining connectivity throughout the countdown and flight is vital for safety (The Aerospace Corporation 2022).

- Telemetry and Data Processing: In addition to the field antennas mentioned earlier, the spaceport needs infrastructure to process and distribute the flight data. Inside the launch control center (or a dedicated telemetry blockhouse), servers and workstations will receive the rocket’s telemetry in real time, decode the myriad data channels, and display critical parameters for engineers and safety officials. A Telemetry Processing Room (or telemetry lab) is set up with data routing equipment, recorders, and real-time data visualization software. For example, the Oklahoma Air & Space Port’s launch control complex features a Telemetry & Monitoring room specifically for this purpose (Federal Aviation Administration 2023). Data processing capabilities also include modeling tools to predict trajectories and blast safety footprints; these are used pre-launch and during flight to aid decision making. All telemetry data is typically archived for post-launch analysis. Given the high data volumes (especially for orbital launches), a robust IT infrastructure and high-bandwidth data links (as noted under Utilities) are essential to support this function (The Aerospace Corporation 2022).

- Security and Surveillance: Launch sites must be highly secured both for safety and national security reasons. The entire facility will be enclosed by perimeter fencing, with controlled entry points and 24/7 surveillance. Public access control measures are required under FAA launch site licensing – only authorized personnel are allowed near the pads, especially during hazardous operations. Security systems typically include CCTV cameras covering the pad and support areas, alarmed gates, and intrusion-detection sensors on the fence line. Credentialing systems (ID badges, biometric access) manage who can enter different zones of the spaceport. On launch days, security is further intensified: local law enforcement and range safety agencies assist with clearing the surrounding hazard zone – for instance, at

SpaceX’s Texas site, law enforcement, Coast Guard boats, and even drones were used to patrol and ensure no unauthorized persons or vessels entered the launch danger area (Clark 2023). Hawai‘i’s spaceport would implement similar launch-day surveillance, possibly coordinating with state law enforcement and the Coast Guard to secure the ocean exclusion zone. Cybersecurity is also part of modern spaceport security; networks and control systems must be protected from hacking or signal interference. A comprehensive security and surveillance infrastructure will ensure the site remains safe from trespassers, espionage, and other threats at all times (The Aerospace Corporation 2022).

Each of the above facilities must be designed to meet federal safety standards and tailored to the specific operations expected at the Hawai‘i launch site. Together, these infrastructure elements create a functional launch complex that can support vertical rocket launches while protecting the public, the environment, and the mission (Federal Aviation Administration 2024).

Throughput & Capacity Needs

UAVs, AAM and UAM vehicles (including eVTOLs), and horizontal-launch spaceplanes require dedicated runway access, large apron space for simultaneous testing and staging, specialized integration hangars, and vertiports or launch rails (Federal Aviation Administration 2024; NASA Armstrong Flight Research Center 2022). Hilo International Airport (ITO), with its 9,800-foot runway and existing FAA tower, is ideally suited for dual-use operations that can accommodate commercial UAV/AAM/UAM testing, air-launch rocket missions, e.g., carrier aircraft releasing orbital vehicles, and horizontal suborbital systems under development by companies such as Fenix Space (State of Hawai‘i Department of Transportation, Airports Division 2025; Fenix Space 2025).

Vertical launch operations, while not co-located at airports, will require a dedicated off-airport site with clear hazard zones, over-ocean trajectories, and separation from population centers (The Aerospace Corporation 2022).

Facility planning must include the following capacity elements to meet forecasted demand for both horizontal and vertical operations (FAA Office of Commercial Space Transportation 2025; Deloitte 2024; Center for Space Policy and Strategy 2024):

- **Horizontal Launch & AAM Facilities** – Runway, taxiway, and apron integration capable of supporting UAVs, eVTOLs, carrier aircraft, and horizontal spaceplanes (Federal Aviation Administration 2024) – Modular integration hangars and clean rooms for payload mating to air-launch vehicles – Vertiports and high-power charging stations for simultaneous AAM operations

- **Vertical Launch Facilities** (dedicated site) – One orbital-class launch pad initially, with site layout preserving space for a second pad as annual launch cadence increases (The Aerospace Corporation 2022; Deloitte 2024) – One suborbital launch pad or liquid/gaseous test stand area for vehicle development and qualification

- **Common Supporting Infrastructure** (shared across horizontal and vertical phases) – Payload processing and integration facilities with modular, clean-room-capable bays (The Aerospace Corporation 2022) – Propellant storage and loading systems (LOX, RP-1, LH2, or methane as required) – Mission control center, telemetry ground stations, and range safety systems – Secure staging areas and hazardous processing facilities sized for multiple customers

Note: A phased, dual-mode approach would allow Hawai‘i to begin revenue-generating horizontal and AAM operations at Hilo within 24–36 months while preserving the ability to add vertical capability at a separate site once environmental reviews and demand are confirmed (Alaska Aerospace Corporation 2021; Spaceport America Master Plan 2025).

Launch Pad & Infrastructure Design Standards

It is recommended development follows FAA Advisory Circular 150/5300–13B (Airport Design) and 14 CFR Part 420 for vertical launch pads (Federal Aviation Administration 2022; Code of Federal Regulations 2025). Pad and runway geometry must ensure safe separation zones for vertical launches and support ground-based taxi or tow operations for UAVs and spaceplanes (The Aerospace Corporation 2022). For UAVs and eVTOLs, the facility must offer

- FAA-compliant vertiPort infrastructure and staging areas (Federal Aviation Administration 2022)

- High-power charging stations or hydrogen refueling options (Federal Aviation Administration 2024)

- Weather-protected bays for sensor calibration and pre-flight testing (The Aerospace Corporation 2022)

- Aprons capable of hosting a mix of rotorcraft, fixed-wing UAVs, and support vehicles (Federal Aviation Administration 2022)

If horizontal launch systems (like Fenix Space) are in scope; jet fuel storage, extended runways, and LOX-safe ground handling must be designed (NASA Armstrong Flight Research Center 2022).

Safety and Fire Codes (NFPA 409, 410, 414)

Facility safety design should be guided by relevant National Fire Protection Association (NFPA) codes (National Fire Protection Association 2022a; 2022b; 2021).

- NFPA 409 Applies to hangar facilities, especially for UAV/AAM maintenance or spaceplane integration. Requires fire suppression systems, foam-based sprinklers, and hazard-class separation (National Fire Protection Association 2022a).

- NFPA 410 Applies to vehicle cleaning and servicing practices. Facilities must include proper ventilation, non-sparking equipment, and contamination containment (National Fire Protection Association 2022b).

- NFPA 414 Guides Aircraft Rescue and Firefighting (ARFF) vehicle requirements. We anticipate needing at least one ARFF unit (Index B/C equivalent) for both rocket and AAM operations (National Fire Protection Association 2021).

Fuel safety zones, and lightning protection must also be considered per NASA Range Safety guidance and DOD Explosives Safety Board (DDESB) standards (NASA 2022; U.S. Department of Defense Explosives Safety Board 2023).

Utility Capacity for Facilities

Power, water, and communication infrastructure must support simultaneous operations (The Aerospace Corporation 2022).

Power: UAV charging and rocket integration facilities may draw several megawatts (Federal Aviation Administration 2024). Hawai‘ian Electric’s Integrated Grid Plan and the capacity of the Kea‘au grid must be reviewed (Hawai‘ian Electric 2024). Battery backup and solar microgrids may be recommended (National Institute of Standards and Technology 2020). A statewide geothermal resource assessment is planned for fiscal year 2025–2026, with the University of Hawai‘i’s Groundwater and Geothermal Resource Center (HGGRC) requesting

$16.5 million in FY25–26 funding for this effort, as confirmed in stakeholder discussions (Hawai‘i State Legislature 2025; Hawai‘i Natural Energy Institute 2024). Aerospace Port demand—particularly for reliable baseload power at Hilo—would strengthen the business case for accelerating this study and infrastructure investment. This aligns with Hawai‘i’s 2045 renewable energy mandate for 100% clean energy, though community engagement remains critical (Hawai‘i Clean Energy Initiative 2025; Hawai‘i State Energy Office 2025).

Water: Fire suppression systems, e.g., foam deluge requires high-volume water supply (Christian 2021). If County lines are insufficient, site-based tanks or wells may be needed (The Aerospace Corporation 2022).

Communications: UAV and NewSpace operations demand high-speed, low-latency connectivity for telemetry and control (Federal Aviation Administration 2024). Fiber optic lines, microwave relays, and dedicated RF spectrum management will be planned (The Aerospace Corporation 2022).

Risk Assessment and Mitigation

This assessment identifies potential risks associated with developing an Aerospace Port in Hawai‘I and describes illustrative mitigation approaches for consideration by a future development organization and the responsible authorities (Deloitte 2024). It does not direct State action, commit any party to proceed, or assign implementation responsibilities to this assessment team (Deloitte 2024). The major risk domains considered are: Safety (launch/flight accidents), Environmental (ecosystems, wildlife, marine), Cultural (sacred sites, practices), Community/Operational (noise, traffic, quality of life), and Regulatory/Liability (compliance and exposure) (Haber and Lamoreaux 2012; NASA / ACTA Inc. 2012; The Aerospace Corporation 2022). The guiding principle ;if a project is pursued by decision-makers ;would be prevention and preparedness through design, procedures, and engagement administered by the appropriate entities (Deloitte 2024; NASA / ACTA Inc. 2012).

Safety Risks (Launch & Flight)

Risk. Launch vehicle failure on the pad or in flight could result in explosions, debris, or fire (FAA Office of Commercial Space Transportation 2022). Illustrative mitigation approaches (to be defined and implemented, if at all, by the development organization and applicable authorities):

- Establish a Ground Hazard Area (GHA) and downrange exclusion zones sized to FAA guidance, e.g., no uninvolved persons within ~7,300 ft for vertical launch operations, with flight trajectories planned to keep debris over unpopulated areas, where feasible (Federal Aviation Administration 2024).
- Employ Automated Flight Termination Systems (AFTS) and conduct range safety analyses for each mission to demonstrate public risk within FAA thresholds, e.g., EC < 1 in 100,000 (Federal Aviation Administration 2024).
- Incorporate range and pad features such as flame trenches and water deluge systems to manage blast and acoustic effects, e.g., ~24,000 gallons cited at Vulcan pad (NASA/FAA n.d.).
- Coordinate with FAA Air Traffic on TFRs during launch windows and with state/county emergency management on incident response plans and roles (Federal Aviation Administration 2024).
- Conduct drills and exercises with local responders, as required by permitting/approval conditions (The Aerospace Corporation 2022).
- Provide public notification protocols appropriate to the site and risk profile, e.g., siren/SMS (U.S. Space Force n.d.).

Note: Historic U.S. commercial launch experience indicates extremely low public injury incidence under a licensed regime; any future operations in Hawai‘i would be required to meet all applicable approvals and safety standards before commencing (FAA Office of Commercial Space Transportation 2022).

Environmental Risks

Risk. Potential effects on sensitive habitats, species, water quality, air quality, and marine environments (Hawai‘i DBEDT 1993). Illustrative mitigation approaches (for a developer/operator to prepare and implement, subject to agency review):

- Prepare and execute an Environmental Mitigation Plan consistent with HEPA/NEPA findings and permit conditions (cf. FAA Starship PEA’s required actions) (FAA Office of Commercial Space Transportation 2022).
- Time construction/operations to avoid critical breeding/migration periods fie example for the Hawai‘ian hoary bat pupping season (June–September) and conduct biological surveys prior to disturbance (U.S. Fish and Wildlife Service 2025).

- Use shielded/down-facing lighting to reduce seabird disorientation; manage noise with site selection, orientation, and sound suppression with recycled water deluge (FAA Office of Commercial Space Transportation 2022).
- Plan trajectories so any jettisoned hardware falls in designated open-ocean zones away from coral and fisheries; coordinate with NOAA on seasonal/migration constraints (NOAA 2024).
- Implement secondary containment for fuels and stormwater controls at pads; apply hazardous-materials handling protocols if relevant (as evaluated in the Palima EIS) (Hawai‘i DBEDT 1993).
- For nearby communities, consider setbacks, natural buffers and, if required by approvals, additional abatement such as noise barriers or home sound mitigations. Any claims about noise levels should be grounded in site-specific modeling and analog data, e.g., ~90 dB peak at ~3 mi for a ~60-ft class rocket for a seconds-to-minute short duration (Christian 2021).
- Establish monitoring (noise, wildlife response, water quality) and adaptive management triggers (FAA Office of Commercial Space Transportation 2022).

Cultural Risks

Risk. Potential impacts to Native Hawai‘ian cultural values, sites, and practices (Honolulu Civil Beat 2019). Illustrative mitigation approaches (to be led by the developer/operator within the environmental/cultural review process):

- Conduct a Cultural Impact Assessment (CIA) as part of HEPA/NEPA; engage lineal descendants and cultural practitioners to identify resources and practices (Hawai‘i State Department of Health n.d.).
- Utilize cultural monitors during ground-disturbing work with authority to pause activities if iwi kūpuna or artifacts are encountered (PISCES 2019).
- Provide cultural sensitivity training for project personnel and incorporate cultural protocols where appropriate (as recommended in prior local practice) (NASA / ACTA Inc. 2012).
- Establish buffers and avoidance for known cultural sites; consult with OHA and SHPD per statutory processes (Hawai‘i State Department of Health n.d.).
- If pursued by decision-makers, consider a Community Advisory mechanism inclusive of kūpuna and practitioners to provide ongoing input (Tauri Group 2023).

Community & Operational Risks

Risk. Community concerns regarding noise, traffic, light, perceived inequities, and day-to-day impacts; regulatory/liability exposure (Honolulu Civil Beat 2019; Kubota 2019). Illustrative mitigation approaches (subject to agency and community processes, if a project proceeds):

- Conduct traffic impact analyses; sequence heavy-haul logistics during off-peak hours and coordinate escorts as required (Federal Aviation Administration 2024).
- For horizontal operations involving aircraft, work with FAA to identify procedures/paths that reduce low-altitude overflight of residential areas where feasible (Federal Aviation Administration 2024).
- Apply dark-sky practices and species-protective lighting; comply with local ordinances (International Dark-Sky Association 2024).
- Address benefits and workforce concerns via locally focused hiring and education programs, if adopted by policymakers and the operator (Tauri Group 2023).
- Maintain transparent communications through public website, notices, and other rumor control proportional to project stage and regulatory expectations (NASA / ACTA Inc. 2012).
- Consider policy instruments including Spaceflight Informed Consent statutes and insurance/indemnification frameworks as determined by policymakers and regulators (Federal Aviation Administration n.d.).

Stakeholder Engagement

Successful development of the Hawai‘i Aerospace Port specifically hinges on:

- Robust stakeholder engagement (Tauri Group 2023). This means ensuring that all parties with a vested interest are involved, heard, and ideally supportive (NASA / ACTA Inc. 2012). Success also hinges on

- Cultivating a skilled workforce (especially local) to sustain the industry (Tauri Group 2023).

This section outlines the engagement efforts to date, the stakeholder landscape, and potential ideas for ongoing outreach. It also discusses workforce development needs and how educational programs in Hawai‘i can be aligned to fill them, so that local residents

benefit from aerospace job opportunities (University of Hawai‘i Space Flight Laboratory 2024).

Engagement to Date: As part of this study, initial outreach was conducted with a cross-section of stakeholders. These include state agencies (HTDC, DBEDT’s Office of Aerospace, HDOT Airports), federal agencies (Pacific Space Force reps), local government officials, and community groups on Hawai‘i Island. Notably, earlier reported conversations with representatives of the Keaukaha and Panaewa Hawai‘ian Home Lands communities near Hilo provided valuable insight into community expectations (Honolulu Civil Beat 2019). Area residents emphasized they want transparency and to be involved from the start, rather than presented with a “done deal (Kubota 2019).

We also engaged the University of Hawai‘i Space Flight Lab whose faculty and students stand to gain (University of Hawai‘i Space Flight Laboratory 2024). We confirmed the University would support the development of programs designed to support an Aerospace Port and the extended ecosystem (University of Hawai‘i Space Flight Laboratory 2024). During 2024–25, as SB581 was being discussed, HTDC and legislators held info briefings that included public testimony; sentiments ranged from enthusiasm about economic possibilities to caution about cultural impacts (LegiScan 2025). These dialogues have shaped the report’s recommendations to emphasize phased trust-building (NASA / ACTA Inc. 2012).

Stakeholder Mapping

- State Agencies: HTDC (project lead), DBEDT (Aerospace Development Office), and HDOT (especially Airports Division for Hilo) are primary drivers (LegiScan 2025). The legislature is also a stakeholder (they fund and set policy; certain senators and reps are champions, as evidenced by funding studies) (LegiScan 2025). State Department of Hawai‘ian Home Lands (DHHL) matters if any site is near or on Department of Hawai’ian Home Lands (DHHL) land, e.g., South Point, (Department of Hawai‘ian Home Lands n.d.). Also, Dept. of Health for environmental oversight (Hawai‘i Department of Health 2023).

- Federal Agencies: FAA AST is crucial for licensing; FAA Air Traffic for integrating launches; U.S. Department of Defense (Pacific Command, Space Force) as a potential customer and for PMRF coordination; NASA for possible research partnerships (Federal Aviation Administration 2025; U.S. Space Force 2024). Also

NOAA, US Fish & Wildlife, EPA as regulators in NEPA (concerned with coastal/marine, species, pollution) (NOAA 2024; U.S. Fish and Wildlife Service 2025; U.S. Environmental Protection Agency 2025). Engaging the Space Force early is worthwhile – indeed, informal talks with Pacific Air Forces indicate interest in a backup launch site (U.S. Space Force 2024).

- Local Government: The County of Hawai‘i (Mayor, County Council) has jurisdiction over zoning and local permits; their support is necessary (Hawai‘i County 2020). So far, the Big Island’s Mayor’s Office has been cautiously supportive pending more community input (Honolulu Civil Beat 2019). County planning and Civil Defense will be stakeholders for land use consistency and emergency planning, respectively (Hawai‘i County 2020). The Puna Community Development Plan Action Committee is a local body to consult if Kea‘au is pursued (Hawai‘i County Planning Department 2023).

- Community and Public Groups: Residents of East Hawai‘i (especially those in Kea‘au, Panaewa, Keaukaha near Hilo) are front-line stakeholders (Honolulu Civil Beat 2019). Key community groups include the Keaukaha-Panaewa Farmers Association and Keaukaha Action Network (KAN) – they have historically been vocal on development near their communities (Kubota 2019). Environmental NGOs like the Sierra Club Hawai‘i, and Malama Hamakua, etc., will scrutinize environmental plans (Sierra Club Hawai‘i Chapter 2025). Also, education communities (UH Hilo, HCC, local schools) as they stand to benefit from STEM programs (University of Hawai‘i at Hilo 2025). The community-at-large must be treated as partners: plan frequent informational meetings and two-way dialogues (not just presentations) (NASA / ACTA Inc. 2012).

- Native Hawai‘ian Organizations: The Office of Hawai‘ian Affairs (OHA) is a formal stakeholder – their Board has tracked aerospace developments (Office of Hawai‘ian Affairs 2025). Before any development, the State must consult with OHA on any potential cultural impacts or benefits (OHA could potentially support STEM programs for Native Hawai‘ians in aerospace) (Office of Hawai‘ian Affairs 2025). The engagement of cultural practitioners and kupuna from Hilo/Puna is vital. This includes caretakers of cultural sites, local halau (hula schools) if relevant, and lineal descendants of any project lands (PISCES 2019). A stakeholder map ensures these voices are not only heard but embedded by having a cultural representative on the advisory board (NASA / ACTA Inc. 2012).

- Industry and Academia Partners: UH (HSFL, PISCES) as mentioned, and potentially companies (even those not yet committed) are stakeholders. Rocket Lab, for example, was involved in initial talks historically, and while they have their own sites now, other companies, like Fenix Space and Blue Origin are analogous stakeholders (University of Hawai‘i Space Flight Laboratory 2024; PISCES 2019). Local business groups like the Hilo Chamber of Commerce are stakeholders seeing potential economic boosts (Hilo Chamber of Commerce 2025). We have engaged the Chamber informally, and they are supportive if the community is onboard (Hilo Chamber of Commerce 2025). The Chamber of Commerce can help rally local business backing (Tauri Group 2023).

- Landowners: For any private lands, e.g., W. H. Shipman, Pulama Lāna‘i, the landowner is a critical stakeholder. We have had preliminary positive discussions with W. H. Shipman Ltd. about the concept – they are open, especially if it aligns with creating jobs in Puna (Honolulu Civil Beat 2019). Pulama Lāna‘i, on the other hand, has indicated via public statements that they align with the Lāna‘i community plan (which is against a spaceport) (Pūlama Lāna‘i 2022). So, stakeholder strategy differs: collaborate with supportive landowners, and tread carefully or reconsider in areas where the landowner or community is opposed (County of Maui 2021).

- Given this landscape, our we suggest an ongoing engagement plan that includes: establishing a formal Project Stakeholder Advisory Committee with representatives from each major group (state, county, community, Native Hawai‘ian, environment, education, industry) (Tauri Group 2023). This committee would meet regularly (perhaps bi-monthly) to review plans and voice concerns (NASA / ACTA Inc. 2012). We also suggest hosting public open houses in Hilo (and other islands as appropriate) well before any EIS hearings – these are informal Q&A sessions to educate the public and let them air concerns early (PISCES 2019). Our team will maintain transparency by publishing materials online and providing avenues for feedback (surveys, dedicated email for comments) (NASA / ACTA Inc. 2012). A particularly important plan is to involve community leaders from day one in site selection deliberations – for instance, if weighing Kea‘au vs. PMRF for vertical site, hold community forums in those locales to gather input before decisions (Honolulu Civil Beat 2019). As noted in the recommendations: “Once this Draft Interim Report is reviewed it is recommended that legislative and community engagement take

place… Community leaders from Keaukaha, Panaewa, and Hilo… as well as critics like KAN, should be part of the process" (PISCES 2019). The state can implement that by organizing a Working Group in early 2026 that includes those community reps to refine the final plan (Tauri Group 2023).

Workforce Development

A core promise of the Aerospace Port must be to inspire and employ local talent (Tauri Group 2023). Hawai‘i will need a pipeline of technicians, engineers, and support staff for spaceport operations and for the broader aerospace ecosystem (drone operators, data analysts, etc.) (Deloitte 2024). Fortunately, there are already strong foundations to build on. Notably:

- Programs like Journey Through the Universe (Maunakea Observatories Outreach) and the annual AstroDay festival have engaged thousands of Big Island students in STEM, integrating Hawai‘ian culture and astronomy (NOIRLab 2025; Maunakea Observatories 2025). The state should plan to partner with such programs to incorporate aerospace content such as rocketry workshops, and drone demos) (NOIRLab 2025).

- Vibrant Hawai‘i's ‘Iliahikū Initiative provides work-based learning for local students with focus on equity and indigenous knowledge (Vibrant Hawai‘i 2025). The Aerospace Port can collaborate by offering internship placements for those students, e.g., a summer intern program at the spaceport for engineering techs, environmental monitoring, etc. (Vibrant Hawai‘i 2025).

- The Hawai‘i Science and Technology Museum (HSTM) on Hawai‘i Island runs robotics camps and even a Community Aerospace Program that formed a student rocketry team (the "Lava Tubes" team mentored by a NASA JPL engineer) (Hawai‘i Science and Technology Museum 2025). The state must support, and possibly expand such initiatives – for example, providing the Lava Tubes team access to launch small rockets or present at spaceport events (Hawai‘i Science and Technology Museum 2025).

- At the higher education level, Honolulu Community College's rocketry team recently won a national First Nations Launch competition in 2024 (University of Hawai‘i News 2024). UH Mānoa and Hilo have engineering and astronomy programs that could pivot some focus to aerospace engineering (University of Hawai‘i at Mānoa 2025;

University of Hawai‘i at Hilo 2025). Hawaii may not (yet) have an aerospace degree program in-state, but it can create certificate programs or specialized training. For instance, UH Hilo could establish a NewSpace tech incubator or a certification in Aerospace Tech (as hinted in recommendations) (University of Hawai‘i at Hilo 2025). The state could provide scholarships for local students to study aerospace engineering or avionics, under an obligation that they return to work at the spaceport (like how some states do for medical professions) (University of Hawai‘i College of Engineering 2025).

- Workforce needs: Initially, many jobs will be technician-level: handling propellants, operating tracking systems, maintaining facilities. These can often be filled by those with electronics/mechanical backgrounds, e.g., graduates of HCC’s Aeronautics or Automotive programs with some additional training could transition to rocket mechanics or UAV maintenance (Deloitte 2024). The state should seriously consider upskilling existing workforce: partner with SBA and trade schools to run short courses (maybe through Hawai‘i Community College) on topics like “Range Safety Operations 101” or “Composite Propellant Handling Certification (Deloitte 2024). Many skills are transferable from other industries present in Hawai‘i, e.g., gas storage handling from fuel depots, telemetry akin to telecom work, etc. (Tauri Group 2023). For more advanced roles (aerospace engineers), the state must recruit both locally and from outside, but with a goal to mentor local juniors to step into those roles over time (Tauri Group 2023).

The State should also consider establishing an Aerospace Workforce Development Fund, perhaps via SB581 if enacted with funding to support training, internships, and scholarships (LegiScan 2025). The STEM pipeline must start early: engaging elementary and middle schoolers so they see a future in aerospace in Hawai’i (NASA 2024). When kids can watch a launch from Hilo, it can light that spark (Center for Aerospace Education 2025). The state must plan to have a strong education outreach office as part of the spaceport organization – doing school visits, inviting classes to tour the facility, running an annual science fair or competition related to aerospace (NASA 2024). A very tangible step: as soon as a project is green-lit, the state must coordinate with DOE and UH to create a timeline of workforce needs, e.g., by 2026 we need X technicians so start a training cohort in 2026; by 2028 we need Y launch operators so send some local students to specialized training on the mainland or in military programs by 2026 (Tauri Group 2023) such as with the Maui based 501c3 CelesTrak Space Domain Awareness (SDA) non-profit; or the Maui SDA TAP lab, and other institutions to incorporate aerospace data analytics training, etc. (SDA TAP Lab 2025). This already is at the forefront of planning, not an afterthought (Tauri

Group 2023). If Hawai‘i pursues the development of an Aerospace Port, they should design a program that aspires not just to host launches, but to cultivate a homegrown aerospace sector. This aligns with broader state goals of keeping talent in Hawai‘I and offering new opportunities that resonate with island values (exploration, navigation – aerospace can be seen as a continuation of Polynesian voyaging heritage, just to the stars) (Center for Aerospace Education 2025). Investing in people – through education and inclusion – will ensure the Aerospace Port is not an isolated facility but an integrated part of the community (Tauri Group 2023).

Decision Considerations and Possible Next Steps

This report is intended to present options and explore feasible pathways. It does not direct State action or make funding or policy decisions. The items below are framed as decision considerations and potential next steps that State leaders and decision makers may choose to pursue, in whole or in part, depending on community input, statutory responsibilities, environmental review outcomes, funding availability, and partner interest. Timelines are indicative only and will need adjustment based on legal processes and stakeholder guidance. Cross-Cutting Considerations (as applicable to multiple options).

1. Community Dialogue & Participation (Near-term through 2026) Purpose: establish a structured avenue for community perspectives to shape any future direction. Potential actions:
    - Host informational briefings and listening sessions on Hawai‘i Island in locations including Hilo, Puna, Ka‘ū; and at other islands if multi-site options remain under consideration (PISCES 2019).
    - Invite broad participation from Keaukaha, Pana‘ewa, and Hilo Town voices. Also, organizations with differing views, including KAHEA Alliance Network, cultural practitioners, educators, local businesses (Kubota 2019).
    - Consider forming a Community Advisory mechanism to provide ongoing input to HTDC and relevant agencies (Tauri Group 2023).
    - Use this period to refine any option set; community sentiment would be a key input to whether and how any option advances (NASA / ACTA Inc. 2012).

2. Independent Technical & Economic Review (2026) Purpose: stress-test assumptions before any commitments. Potential actions:

- Engage subject-matter experts for range safety, launch operations, airspace, environmental, cultural resources to vet feasibility and inform scope (The Aerospace Corporation 2022).
- Commission an independent economic analysis, e.g., via University of Hawai‘i or third-party consultancy to validate business and workforce projections and identify risks/sensitivities (Tauri Group 2023).
- Where relevant, commission preliminary engineering scoping for candidate near-term upgrades and/or new developments such as hangar adaptations and telemetry sites to assess “shovel-readiness” and refine costs (Deloitte 2024).

3. Environmental & Regulatory Pathfinding (Initiation no earlier than late 2026) Purpose: understand statutory pathways and likely scopes before pursuing any development. Potential actions:
   - Coordinate early with Hawai’i’s Office of Environmental Control and the Office of Planning and Sustainable Development
   - Office of Environmental Quality Control/ Office of Planning and Sustainable Development (OEQC/OPS) and FAA regarding HEPA/NEPA sequencing and opportunities for joint or tiered review (Hawai‘i State Department of Health n.d.; Federal Aviation Administration 2025).
   - Based on scoping and public interest, anticipate that an Environmental Impact Statement may be appropriate; prior documents such as the 2019 Kea‘au Draft EA (Alaska Aerospace Corporation & FAA 2019) and the 1990s Palima Environmental Impact Survey (Hawai‘i DBEDT 1993)) may inform but not substitute for new analysis (Hawai‘i State Department of Health n.d.).
   - If an FAA launch site operator license is contemplated under any option, consider pre-application consultation to align environmental and safety documentation (Federal Aviation Administration 2025).
   - Emphasize that no operations would occur absent all required approvals and permits (Federal Aviation Administration 2025).

4. Outreach, Transparency & Trust-Building (Ongoing) Purpose: maintain visibility and two-way communication independent of schedule. Potential actions:
   - Maintain a public website housing non-confidential materials (studies, meeting notes, monitoring summaries) (NASA / ACTA Inc. 2012).
   - Consider an on-island point of contact or office hours (Tauri Group 2023).

- Provide accessible summaries of planned safety, cultural, and environmental practices once drafted; report on how feedback has influenced option refinement (NASA / ACTA Inc. 2012).

5. Safety, Cultural Stewardship & Environmental Management (Before any operations) Purpose: embed safeguards from the outset. Potential actions:
   - Develop Safety, Cultural, and Environmental Management Plan frameworks reflecting mitigation measures identified in HEPA/NEPA and community input (Hawai‘i State Department of Health n.d.).
   - Establish coordination protocols and memorandums of Understanding (MOUs) with emergency responders as appropriate for any selected option (Federal Aviation Administration 2024).

6. Partnerships & Workforce (Exploratory, 2026 onward) Purpose: test market interest and align education pathways without presuming outcomes. Potential actions:
   - Gauge interest from potential users (commercial, defense, academic) via non-binding discussions or expressions of interest; avoid commitments prior to environmental review outcomes (Tauri Group 2023).
   - Collaborate with UH and community colleges on curricula and training concepts that are useful across aerospace-adjacent industries, regardless of the specific option ultimately pursued (University of Hawai‘i Space Flight Laboratory 2024).

Option-Specific Illustrative Pathways (Indicative, Not Prescriptive)

Option A: Horizontal Launch / Aerospace Operations at Hilo (Phaseable path)

- If community input, environmental review, and responsible agencies indicate feasibility, potential near-term investments could include modular integration space, telemetry/communications, and limited airside improvements coordinated with HDOT Airports.
- Any airspace changes would proceed through FAA coordination and standard procedures.
- Early activities (e. g., UAV exercises or academic demonstrations) could be used, if approved, to validate procedures and inform future decisions.

Option B: Purpose-Built Vertical Launch Site (e. g., Kea‘au or alternative)

- Site selection would depend on the outcome of HEPA/NEPA, cultural consultation, technical studies, and community perspectives.

- If an identified site advances, potential steps could include site control (purchase/lease), detailed design, and phased construction, subject to permits, approvals, and funding decisions by the responsible entities.
- For Department of Defense–associated locations such as a PMRF-related path with additional federal coordination, e. g., CSOSA or similar instruments may be required and could extend schedules.

Option C: Distributed/Hybrid Model (Horizontal now; vertical later or at another site)

- Authorities may consider sequencing that builds operational experience and workforce capacity under a lower-impact configuration before contemplating higher-impact infrastructure, contingent on demonstrated benefits and trust.

Policy & Enabling Environment (If pursued by policymakers)

Potential legislative or administrative items could include:

- Considering a state spaceflight participant liability framework (consistent with other states), subject to legislative process.
- Evaluating incentives targeted at local hiring and investment, e.g., enterprise zone/HUBZone alignment) where appropriate and lawful.
- Reviewing county zoning/permitting pathways, e.g., agricultural land use considerations) to clarify processes should any option proceed.
- Exploring interagency coordination instruments, e.g., FAA–State understandings) to reduce duplicative review while maintaining rigor.

Education, Workforce, and Industry Development (Parallel Tracks)

Independent of which option ;if any ;advances, stakeholders could:

- Support scholarships, internships, and applied research in aerospace-adjacent fields (2025–2026 onward).
- Encourage UH to evaluate certificates or specializations responsive to industry demand (targeting 2027 or later, if warranted).
- Consider hosting knowledge-sharing events to connect local firms, students, and potential partners.

Indicative Timeline Logic (Subject to Change)

- **2026:** Listening sessions; advisory mechanism; independent technical/economic review; scoping for HEPA/NEPA; preliminary engineering where relevant.

- **Late 2026–2028:** Initiate formal environmental processes and FAA coordination (as applicable); continue engagement and transparency; there should be no planned construction or operations prior to required approvals.
- **2027–2030:** If approvals are granted and decision-makers elect to proceed, design, procurement, and phased implementation would be sequenced by option, with safety and stewardship plans finalized before any operations begin.

Important Note on Governance and Decisions

The steps described above are possibilities, not directives. Any advancement would require: (1) decisions by the appropriate authorities; (2) meaningful community engagement and consideration of feedback; (3) completion of all environmental and cultural reviews; (4) identification of funding by responsible entities; and (5) satisfaction of all regulatory and safety requirements. This report's role is to inform those decisions by outlining options, trade-offs, and potential paths ;not to predetermine outcomes.

This report presents a spectrum of possibilities ;from modest AAM testing to full orbital launch capability. The path forward depends on stakeholder priorities, community feedback, and evolving market demand. No single option is prescribed; all require deliberate evaluation to align with Hawai‘i's economic, cultural, and environmental values.

Conclusion

Hawai‘I has the opportunity to join the frontiers of aerospace – an industry that is growing rapidly and reshaping economies around the globe (McKinsey & Company & World Economic Forum 2024). This assessment has explored the strategic, technical, economic, and cultural dimensions of establishing an Aerospace Port in the islands. The findings are overwhelmingly positive: Hawai‘i has the right ingredients – from geography to infrastructure to talent – to make this endeavor a success, provided it follows a path that respects local values and proactively addresses challenges (NASA 2022; Deloitte 2024). The development of a Hawai‘i Aerospace Port can diversify the state's economy with new high-paying jobs and industries, enhance Hawai‘i's strategic role in national aerospace and defense (a Pacific launch capability), and inspire the next generation of local scientists and engineers (Tauri Group 2023; U.S. Space Force 2024; NASA 2024). An Aerospace Port would leverage Hawai‘i's natural competitive advantage (an equatorial, ocean-surrounded location) in a way few other locations can (NASA 2022). If realized, Hawai‘i could see tens of millions in economic activity, a strengthened tech workforce, and global recognition as a center for innovation – all aligning with the state's goals for economic innovation and sustainability (Tauri Group 2023; Deloitte 2024).

If the state proceeds, success will depend on key success factors repeatedly identified in this report: speed, trust, and execution. Speed, because the market demand is now – waiting too long could mean losing potential business to other states or countries (FAA Office of Commercial Space Transportation 2025). Trust, because Hawai‘i’s communities and cultural stewards must be partners; without social license, no project can endure (NASA / ACTA Inc. 2012). And execution, because even the best plans require disciplined follow-through – building facilities to standard, managing operations safely, and delivering promised benefits (jobs, education) to the community (Deloitte 2024).

Lessons from past projects should inform our approach to engage transparently and early, to weave cultural respect into the project’s DNA, and to ensure that Hawai‘ians see the Aerospace Port as theirs (NASA / ACTA Inc. 2012). This assessment has sketched out the framework and provided some direction, but it is not the final word. In fact, a recurring theme has been the need for continued input and refinement. If the State is to proceed to the next steps (detailed in the prior section), it will need to gather more data, more perspectives, and likely adjust specifics – and that is a strength, not a weakness. By doing so, the final plan and eventual operations will be far more robust and inclusive. This assessment should be viewed as a living document – a foundation upon which more will be built as stakeholders contribute (Deloitte 2024).

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