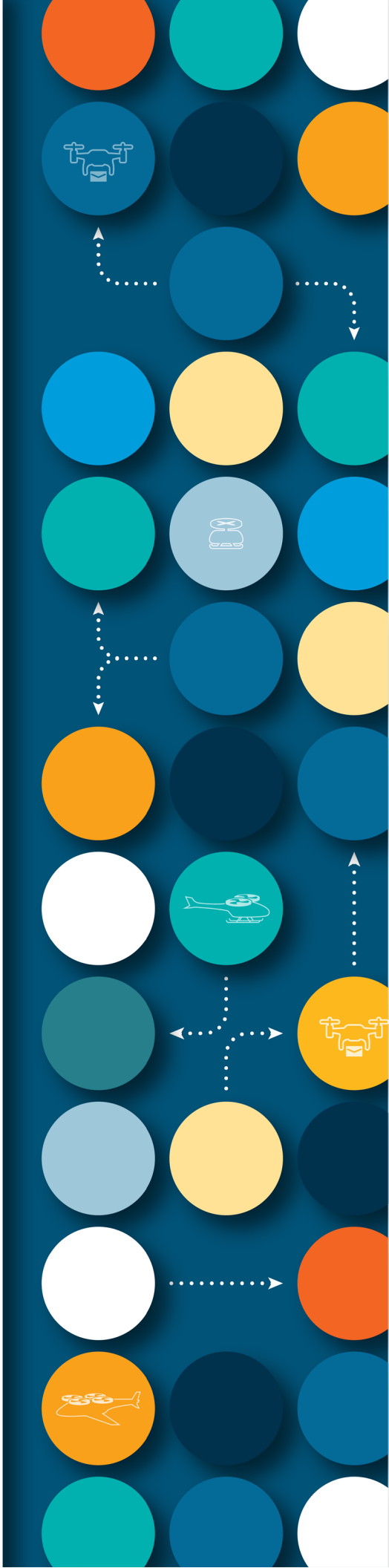
December 2025 DRAFT

ADVANCED AIR MOBILITY

Infrastructure Readiness and Three-Year Implementation Work Plan



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DRAFT Advanced Air Mobility Infrastructure Readiness and Three-Year Implementation Work Plan

October 2025

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1.0 EXECUTIVE SUMMARY

Advanced Air Mobility (AAM) is an emerging transportation mode that focuses on electric or hydrogen-fueled aircraft to create reduced- or zero-emission aviation. AAM proposes new aviation markets that feature on-demand aviation services to support passenger mobility, goods delivery, and emergency response in diverse locations—from densely populated urban centers to hard-to-reach remote locations (Cohen et al., 2021; Reiche et al., 2018).
AAM emerged as technologies converged—technological advancements and industry investment in electrification, automation, vertical takeoff and landing (VTOL) aircraft, Unmanned Aircraft Systems, and air traffic management. Changes in technology advanced innovations such as new aircraft, passenger and cargo transportation services, and other aviation business models that may be incorporated into California's multimodal transportation system (Cohen et al., 2021). AAM proposes new aviation markets that feature on-demand aviation services to support passenger mobility, goods delivery, and emergency response in diverse locations.

A functional AAM operational environment requires new aircraft models and new infrastructure for both airspace and ground-based systems. New aircraft models include (1) Conventional Takeoff and Landing (CTOL) aircraft with fixed wings that uses runways and airports to take off and land; (2) Short Takeoff and Landing (STOL) aircraft that requires up to 500 feet to take off and land and do not necessarily require paved runways; and (3) Vertical Takeoff and Landing (VTOL) aircraft that operate similar to helicopters and can take off and land without runways. California's existing public use airport and intermodal transportation system offers broad opportunities for AAM operation. While these facilities can be leveraged to support forthcoming AAM operations during its early stages, they may be constrained by location, size, capacity, airspace, community impacts, and other considerations.

California **Senate Bill 800 (Caballero, Chapter 416, Statutes of 2023)** Advanced Air Mobility, Zero-Emission, and Electrification Aviation Advisory Panel (SB 800), required the California Department of Transportation (Caltrans) to establish an advisory panel to assess the feasibility and readiness of existing infrastructure, develop a three-year prioritized workplan, and identify pathways for promoting equity of access to AAM infrastructure.

The advisory panel consists of representatives from state, federal, local agencies, airport representatives, and AAM Original Equipment Manufacturers (OEMs).

Three-year Implementation Work Plan

The advisory panel proposes a work plan to support the initiation of AAM development in California during a three-year timeframe. The workplan includes tasks that involve multiple state agencies, including Caltrans, California State Transportation Agency (CalSTA), the Governor's Office of Land Use and Climate Innovation (LCI), the Governor's Office of Business and Economic Development (GO-Biz), California Energy Commission (CEC), California Air Resource Board (CARB), the Department of Finance, and the State Legislature. Additionally, the workplan requires interagency collaboration and coordination with Original Equipment Manufacturers (OEMs) and other stakeholders.

Workplan highlights include the following tasks:

1. Review relevant statutes in the Public Utilities Code (State Aeronautics Act) and regulations related to address AAM.
2. Review the state's transportation plans and guidelines, such as the California Transportation Plan and the California Airport Land Use Compatibility Handbook, for necessary updates.
3. Identify energy and infrastructure needs and funding opportunities for AAM-related infrastructure and business development to assist California's airports.
4. Conduct community and public outreach, engaging with local and regional planning agencies, and developing best practices to assist AAM planning and evaluation at the local level.
5. Establish AAM forums between state agencies, and with OEMs, and industry professionals into pursuit of the State's goals of advancing AAM and zero-emission aviation.

This report presents the findings of the advisory panel and addresses the requirements of SB 800. The report was prepared under a contract with Mead and Hunt, supported by their subcontractors Harris Miller Miller & Hanson Inc., Woolpert, Aura Network System, and the Community Air Mobility Initiative (CAMI).

2.0 CALIFORNIA AND ADVANCED AIR MOBILITY

The legal definition of AAM has evolved along with the technologies that will support its deployment. The following definitions were included in the Federal Aviation Administration Reauthorization Act of 2024 (Public Law 118-63, Section 951).

Advanced Air Mobility: means a transportation system that is comprised of urban air mobility and regional air mobility using manned or unmanned aircraft.

Regional Air Mobility: means the movement of passengers or property by air between two points using an airworthy aircraft that:

(A) has advanced technologies, such as distributed propulsion, vertical takeoff and landing, powered lift, nontraditional power systems, or autonomous technologies.
(B) has a maximum takeoff weight of greater than 1,320 pounds; and
(C) is not urban air mobility.

Urban Air Mobility: means the movement of passengers or property between two points in different cities or two points within the same city using an airworthy aircraft that:

(A) has advanced technologies, such as distributed propulsion, vertical takeoff and landing, powered lift, non-traditional power systems, or autonomous technologies; and
(B) has a maximum takeoff weight of greater than 1,320 pounds.

The Federal Aviation Administration (FAA) is responsible for integrating AAM into the National Airspace System and ensuring that this new generation of aircraft maintains the highest level of operational safety as defined by commercial aviation today.

AAM System Requirement

New infrastructure that accommodates AAM operations, beyond traditional airports and heliports, includes vertiports and associated energy components. Vertiports are designed to accommodate eVTOL aircraft in urban and suburban areas and are envisioned to integrate with multimodal transportation hubs. Energy components include essential power infrastructure, such as charging

facilities, battery swap or hydrogen fuel cell swap, thermal management, battery cell recycling, aircraft rescue and firefighting facilities, high-speed data, and cybersecurity systems.

Infrastructure Readiness

Commercial service airports statewide and many general aviation airports with a minimum runway length of 3,000 feet can support the operation of CTOL aircraft. Any of the existing public use airports across the state can accommodate STOL and VTOL aircraft. Surface transportation facilities that are equipped with zero emission infrastructure, including highway corridors and safety roadside rest areas, have the potential to support AAM operations for use cases like air taxis and airport shuttles. This will require future analysis and evaluation.

While existing facilities can be leveraged to support forthcoming AAM operations during its early stages, these facilities may be constrained by location, size, capacity, airspace, or other considerations. Commercial services airports, general aviation airports, and heliports are challenged by insufficient energy capacity, limited aircraft parking, restricted access, and inadequate hangar space, thus, it is crucial to factor in potential delays and begin planning early. Existing heliports may not be sized to accommodate larger VTOL aircraft. While vertiports may operate on or off airports, competition among AAM service providers is anticipated for vertiport takeoff and landing areas, as well as for support facilities, particularly when demand for a facility by multiple service providers exceeds available capacity. Introducing AAM facilities outside of airports may require approval from the jurisdictional government as well as compliance with laws and regulations for installing charging infrastructure, which could cause potential barriers and delays for adoption.

To support the readiness of the AAM infrastructure, regulations and guidance must be reconsidered to ensure safety, environmental compliance, and the protection of the public interest. At the federal level, the FAA envisions AAM maturity as a system characterized by new operational rules, new infrastructure, and a high degree of automation. Key regulatory considerations for vertiports include design, land use compatibility, and compliance with the National Environmental Policy Act. At the State level, regulatory considerations include compliance with the State Aeronautics Act, such as site approval and permit

issuance for new facilities, land use compatibility, and compliance with the California Environmental Quality Act. State aeronautics priorities include safety, noise impacts, overflight, and airspace protection, which coincide with federal guidance. There are numerous other federal and state laws that may require other environmental site evaluations. In addition, early engagement with the appropriate jurisdiction, fire protection agency, and the utility providers are critical to protecting public safety and reducing delays in deploying energy components.

2.1 California's Innovation Culture

As a recognized leader in innovation, California is poised to foster AAM research and development and become an early adopter of new transportation technologies and services. The State offers leadership in diverse technology and knowledge-based industries, established research institutions that provide unrivaled human capital and valuable intellectual property, and an entrepreneurial culture aided by early-state risk capital to bring innovations to market (DeVol et al., 2015).

California's innovation economy includes diverse high-tech industries, for example, home to Silicon Valley, the San Francisco Bay Area (which includes substantial technical talent), and the Monterey Bay Area, which is home to AAM-related businesses including original equipment manufacturers (OEMs) such as Joby Aviation, Archer Aviation, and Wisk Aero.

2.2 State Interests and Global Collaboration

California has been a domestic and global leader in environmental protection and sustainability for decades. The environmental protection and evaluation framework presented in the 1970 California Environmental Quality Act (CEQA) has been emulated by agencies nationwide. In 2006, Assembly Bill 32, The California Global Warming Solutions Act set a target to return greenhouse gas emissions to 1990 levels by 2020.

In recent years, Governor Newsom and the California Legislature have significantly increased climate investments to deliver climate action. **Assembly Bill 1279 (Muratsuchi, Chapter 337, Statutes of 2022)**, California Climate Crisis Act, established state policy to achieve carbon neutrality as soon as possible, but no

later than 2045; to maintain net negative greenhouse gas (GHG) emissions thereafter; and to ensure that by 2045 statewide anthropogenic GHG emissions are reduced at least 85 percent below 1990 levels. The Act also required the California Air Resources Board (CARB) to identify and recommend measures to achieve carbon neutrality.

CARB's *2022 Scoping Plan for Achieving Carbon Neutrality* identifies the transportation sector as the primary source of GHG emissions in California. The plan identifies the need to transition 20 percent of aviation fuel demand to zero-emission technologies by 2045 with an accompanying transition of the remaining fuel use to sustainable aviation fuel.

2.2.1 Global Collaboration on Climate Change and Innovation

Since 2021, the Governor's Office of Land Use and Climate Innovation, formerly known as the Office of Planning and Research, has collaborated with the European Institute of Innovation and Technology Climate Knowledge and Innovation Community through a Memorandum of Understanding (MOU) signed during the 2021 United Nations Climate Change Conference in Glasgow, Scotland. The MOU acknowledges California's efforts to collaborate with partners "to effect systematic change… including a transportation program to accelerate the adoption of innovation that enables the State to reach its climate change objectives." The MOU establishes a flexible framework to undertake education, program development, and the deployment of system solutions to combat climate change by developing knowledge-sharing programs and best practices, exploring demonstration projects, exploring new financing mechanisms that engage private capital, and promoting joint participation in conference, commercial, and trade missions to promote collaborative efforts between the State of California and the European Union.

2.2.2 Global Collaboration on AAM

California's ambitious environmental and sustainability goals have been recognized globally, and California leaders continue to work with other leaders internationally to identify opportunities for collaboration and joint learning on diverse topics, including AAM. State representatives have been working with the Netherlands since 2022:

- In 2022, the Governor's Office of Land Use and Climate Innovation organized the first European Union-California Urban Air Mobility Roundtable at San Jose State University with more than 30 experts from California and the European Union (Province of Noord-Holland, Sorama, and others).
- In 2022, the State of California's Environmental Protection Agency (CalEPA) entered into a Memorandum of Understanding with the Dutch State to share ideas about sustainable mobility.
- In 2023, the Governor's Office of Land Use and Climate Innovation supported collaboration with the Provence of Noord-Holland to consider the opportunities and challenge associated with AAM and zero-emission aviation. A delegation of U.S. representatives, including members from the State of California, traveled to the Netherlands to gain insights regarding the AAM state of play from scholars, OEMs, and the country's involvement in the Living Labs program of the European University Alliance.
- In 2023, the Governor's Office of Land Use and Climate Innovation executed a study on how to integrate Sustainable Air Mobility into Long Range Land Use Planning. This study recommended the development of multiple Living Labs in California within underserved communities in the coming years.
- In 2024, the State of California and the Government of the Province of Noord-Holland acknowledged their ongoing collaboration in AAM and signed a Letter of Intent to exchange experiences and knowledge related to the integration of AAM into the transportation system. The signing ceremony coincided with an Innovation Mission by European Union experts in Sacramento, where the Living Labs study was introduced.

2.3 Federal and State Laws Supporting AAM

Public Law No. 117-203, the Advanced Air Mobility Coordination Act, was passed by the U.S. Congress in October 2022 "to plan for and coordinate efforts to integrate AAM aircraft into the national airspace system, and for other purposes." The Advanced Air Mobility Coordination Act recognizes AAM as a "key area of sustainable transportation" and required the establishment of a working group at the federal level to plan and coordinate efforts for the development of a mature AAM ecosystem in the United States. The law requires the development of an AAM national strategy and the formation of an AAM Interagency Working Group. The U.S. Department of Transportation is leading

the development of the national strategy Information is available at: https://www.transportation.gov/aamiwgIn.

In California, SB 800, was passed in response to The Advanced Air Mobility Coordination Act. SB 800 amended Section 21208 of the Public Utilities Code (PUC) to address AAM. Similar to the federal law, SB 800 established an advisory panel, to be known as the Advanced Air Mobility, Zero-Emission, and Electrification Aviation Advisory Panel, to assess the following and prepare a report to the State Legislature on the following:

- The feasibility and readiness of existing infrastructure in the state to support a vertiport network to facilitate the development of advanced air mobility services.
- The development of a three-year prioritized workplan that maps out medium-term state activities necessary for the state to advance advanced air mobility services for Californians.
- Pathways for promoting equity of access to advanced air mobility infrastructure to ensure open access and prohibit the monopolization of advanced air mobility infrastructure ownership and operations.

2.4 AAM Infrastructure Readiness and Three-Year Implementation Plan

To further statewide AAM efforts and respond to SB 800, Caltrans and CalSTA undertook necessary research, convened an Advisory Panel, and developed the following Advanced Air Mobility Infrastructure Readiness and Three-Year Implementation Plan (Implementation Plan). All research was presented to the Advisory Panel for review and discussion during a series of four meetings held on August 2023, January 2024, August 2024, and December 2024.
Research was conducted during a 15-month project period that addressed the goals of SB 800.

The plan summarizes the findings and identifies policy recommendations to further zero-emission aviation and underscores California's commitment to a more sustainable transportation system. The following agencies and entities were invited to be part of the Advisory Panel.

- Federal Aviation Administration
- National Aeronautics and Space Administration
- California Air Resources Board
- California Strategies, LLC
- California Energy Commission
- City of Los Angeles
- City of San Jose
- Contra Costa County Transportation Authority
- Byron and Buchanan Airports
- Palo Alto Airport
- Original Equipment Manufacturers (Joby, Archer, Elroy, Wisk, Overair, and Supernal)

3.0 THE AAM ECOSYSTEM

AAM is an emerging, technology-driven transportation mode that features new aircraft and new infrastructure and promises to disrupt traditional aviation and transportation planning and operations by introducing new aircraft, infrastructure, and transportation services to diverse geographies. The emerging AAM ecosystem will augment California's multimodal transportation to support the State's diverse geography and population and yield new opportunities for the world's fifth largest economy.

3.1 New Aircraft

AAM features the use of emerging electric or hydrogen-powered aircraft that might not require airports or runways. In some cases, existing aircraft can be equipped or retrofitted to include electric- or hydrogen-powered aircraft and operate using airports and runways. Emerging aircraft may have the option to operate outside of airports altogether.

There are three broad types of aircraft that are associated with AAM:

- **Conventional Takeoff and Landing aircraft (CTOL):** are fixed-wing aircraft that take off and land using runways and airports.
- **Short Takeoff and Landing aircraft (STOL):** require up to 500 feet to take off and land and do not necessarily require paved runways, making them well suited for emergency and military transport in areas that may not have runways.
- **Vertical Takeoff and Landing aircraft (VTOL):** operate similar to helicopters and can take off and land without runways.

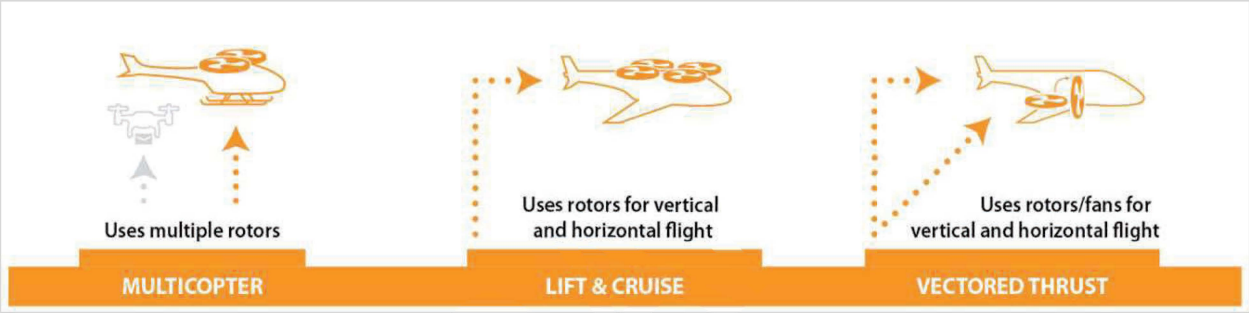
Hundreds of innovative aircraft concepts are emerging from established aircraft manufacturers and OEMs. The emergence of distributed electric propulsion systems, which feature the use of electrically driven propulsors, continue to advance the potential for new aviation aircraft and uses.

The Vertical Flight Society Aircraft Directory provides a database that identifies concepts/proposed designs for electrically powered vertical takeoff (eVTOL) aircraft. As of 2024, the Vertical Flight Society had tracked more than

1,000 eVTOL concepts from more than 400 designers. All aircraft will require a certification of airworthiness from the FAA. While the aircraft concepts tracked by the Vertical Flight Society vary in their degree of development, some OEMs have begun the process to gain FAA certification and plan to enter service by 2030. Most of the early entrant aircraft will include a pilot on board.

Over time, the term "AAM" has become a general term for aircraft that use distributed electric propulsion systems and are capable of eVTOL. Proposed eVTOL aircraft fall into three categories: multicopter, lift and cruise, and vectored thrust (**Figure 1**).

Figure 1: Emerging Aircraft Categories



3.1.1 Environmental Benefits

The use of eVTOL aircraft powered by electric- or hydrogen-powered engines has the potential to offer environmental benefits.

- **Reduced or Zero Emission Operations:** Electric- or hydrogen-powered aircraft engines provide reduced or zero emissions during operation, reducing the amount of aviation-related GHG emissions and furthering efforts toward more sustainable aviation.
- **Comparatively Quieter Operations:** Relatively quieter electrical engines that have potential to reduce the area subject to aircraft noise exposure.
- **Greater modal integration:** Regardless of vertiport siting, first-/last-mile transportation will continue to be important to passengers. As California moves forward, it will be important to integrate AAM with existing transportation hubs, such as multimodal centers and ride-sharing services.

3.2 New Infrastructure

Advanced Air Mobility will require an extensive infrastructure network. While California's aviation system can support initial operations, at least one end of an AAM route is likely to occur at an airport/heliport during initial operations. New facilities will be needed to accommodate AAM operations outside of airports and heliports. New locations for eVTOL takeoff and landing, referred to as vertiports, will be similar to heliports. Vertiports are envisioned in urban and suburban areas in association with multimodal transportation hubs, such as transit centers, train stations, and event venues, near highway corridors and in rural areas to access nearby cities, medical facilities, and other transportation facilities (e.g., regional airports/passenger rail), as shown in **Figure 2.**

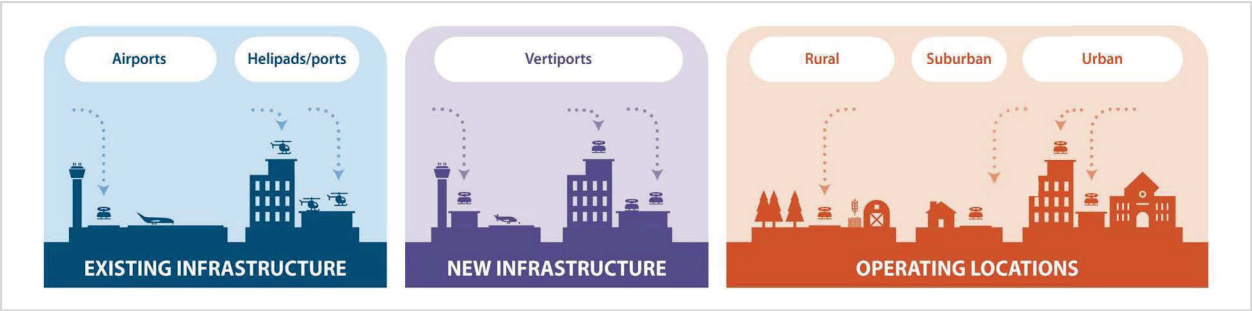
3.2.1 Vertiports

The FAA defines a vertiport as "a designated area for VTOL aircraft, including eVTOL (electric vertical takeoff and landing) aircraft to takeoff, land, and execute ground operations". Typical components associated with a vertiport would include designated areas for aircraft parking, charging, and other components identified in the 2024 FAA Engineering Brief (EB) 105A, *Vertiport Design*.

Although not defined in EB 105A, some variations in terminology are proposed in industry literature to describe the scale of proposed AAM operations. In such cases, the term "vertiport" is used as an umbrella term to include these variations, such as:

- **Vertistop:** A minimally developed vertiport for boarding and discharging passengers and cargo (i.e., no fueling, defueling, maintenance, repairs, or storage of aircraft, etc.).
- **Vertihub:** An area of land or a structure that supports high-frequency electric, hydrogen, and hybrid VTOL operations with associated buildings and facilities. A vertihub would include multiple takeoff and landing positions (Vertipads), multiple aircraft parking positions, passenger amenities, charging infrastructure, battery/hydrogen-fuel cell swapping capability, thermal management, maintenance, repair, and overhaul services, battery pack changes, and high-speed data operations.

Figure 2: Conceptual Vertiport Facilities and Locations



Source: Modified from Thompson et. al. 2024.

3.2.2 Energy and Other Infrastructure Components

As the name denotes, eVTOL aircraft require electricity, whether it is provided by batteries or by hydrogen fuel cells, to power aircraft motors, and these power needs are significant. It is unlikely that all airports or proposed vertiport locations have the necessary infrastructure to meet the voltage and charging rate demands of eVTOL aircraft. Additionally, public utilities may face some constraints with meeting these additional voltage demands. The ability to get adequate electric power to a vertiport will be a critical consideration when siting eVTOL infrastructure.

According to the 2019 NIA-NASA Urban Air Mobility Electric Infrastructure Study, the typical airport electrical infrastructure requirements for Urban Air Mobility charging include a concrete pad to accommodate electrical components that is 500 feet long by 170 feet wide and supports a minimum of three 600-kilowatt eVTOL vehicle chargers (Black & Veatch, 2019). Depending on the number of chargers and power demand, the utility distribution system at a vertiport site may need to be upgraded to alleviate overloading the equipment during peak charging. High-voltage, fast-charging infrastructure will be needed for each parking position, meaning that the amount of energy will increase as the tempo of AAM Urban Air Mobility (UAM) operations increases.

The National Renewable Energy Laboratory (NREL) conducted several studies that were sponsored by the FAA pertaining to AAM. A 2023 study, *Vertiport Electrical Infrastructure Study*, conducted research to identify the electric load demands associated with introducing eVTOL. When considering electrical infrastructure upgrade needs, NREL contacted several OEMs who reported peak

direct-current charging loads of 300 kilowatts to 1 megawatt, and it recommended that vertiports plan for charging loads of 1 megawatt (and potentially higher) (NREL 2023a).

Overview of Potential Hazards in Electric Aircraft Charging Infrastructure is another study conducted by NREL on behalf of the FAA in association with AAM. The FAA-sponsored report identifies the potential hazards associated with the deployment of electric aircraft and associated charging infrastructure, including natural, human, and technological causes that can lead to fire (thermal), physical, or chemical hazards. Applicable standards are provided to help operators select appropriate sites for electric vehicle supply equipment infrastructure mitigation planning, deployment considerations, and staff training (NREL, 2023b).

In addition to charging facilities, other power and infrastructure will be required to support forthcoming AAM operations as follows:

- **Battery Swap or Hydrogen Fuel Cell Swap:** An after-flight battery swap may include high temperature, ergonomics, and safety implications. Local or jurisdictional authorities will need to be engaged early to accept the concept of storing batteries onsite.
- **Thermal Management:** The components of a charging and battery system may be exposed to/experience high temperatures during charging. Cooling processes will be required to manage the charge/discharge rate. Aircraft cabin climate controls may be necessary to maintain passenger comfort.
- **Battery Cell Recycling:** Large lithium batteries are the primary source of energy for eVTOL aircraft. Recycling lithium can be difficult and poses hazards.
- **Aircraft Rescue and Firefighting Facilities:** These facilities are required at commercial airports, but the need for firefighting exists for all airports, and the responsibility often falls to the local fire station. Firefighter training must be required to address the fire hazards associated with electric propulsion.
- **High-Speed Data:** The ability to provide high-speed data will be a requirement for eVTOL operations because it enables real-time communication, precise navigation, and efficient coordination, which can ensure safety and optimal performance during flight.

In addition to these components, cyber security systems will be critical for aircraft electrification. The FAA sponsored a study by the National Renewable Energy Laboratory to evaluate key considerations of cybersecurity systems, including the stakeholder landscape associated with energy storage systems onboard aircraft. The report, *Addressing Electric Aviation Infrastructure Cybersecurity Implementation*, considers ground vehicles relevant to the aviation sector and the facility requirements applicable to future charging systems. In addition, the report offers guidance and recommendations for integrating cybersecurity strategies into the electric aviation system during the initial stages of design and procurement to make operational infrastructure more defensible and resilient (NREL 2022).

3.3 New Aviation and Multimodal Uses

California's diverse geography ranges from the flat, arable lands of the Central Valley to the peaks of the Sierra Nevada, and its population spans this geography from dense urban areas to remote desert and mountain areas. Since many AAM operations do not require runways, AAM is poised to serve a variety of environments and uses or "use cases." Some aircraft are best suited for local uses and short-distance travel (less than 50 miles) while others are better suited for regional uses and longer travel distances (up to 500 miles).

The various roles or use cases associated with AAM operations can include passenger mobility, logistics and goods delivery, aeromedical services, emergency response or disaster relief operations, and other professional and industrial uses (**Table 1** on page 17). The potential use cases highlight the diversity of forthcoming AAM operations and the need to create new intermodal opportunities and integrate AAM into California's current multimodal transportation system.

Table 1: Envisioned AAM Uses

Use Case	Description
Urban Air Mobility (UAM) Mission and Use Cases	
Airport Shuttle	Scheduled or on-demand transport between major and regional airports and between city center or suburban locations. During the early stages of UAM implementation, it is anticipated that most trips will originate or end at an airport.
Air Taxi (on-demand)	On-demand air-taxi uses are envisioned to transport people within a city or its metro region. Air taxis could originate at airports or employment centers to accommodate one or multiple passengers.
Corporate Aviation	Transportation between corporate campuses and business destinations, interfacility corporate transport, regional campus transport, campus-to-customer transport, and specialist team mobility.
Local Package Delivery	Transportation of small packages and on-demand commerce from or between airports, distribution centers, manufacturers, and retailers to end consumers.
Emergency Services	Medical services transportation includes medical evacuation, hospital-to-hospital and equipment transportation, organ delivery, and search and rescue. Both VTOL and small unmanned aircraft systems are envisioned for this use case.
Regional Air Mobility (RAM) Mission and Use Cases	
Regional Airport Shuttle	Scheduled or on-demand transportation between major and regional airports. Regional service could enable travelers to reach airports in remote areas or airports that are not served by the FAA's Essential Air Service Program.

Use Case	Description
Emergency Response / Disaster Recovery	Emergency response could include medical evacuation, hospital-to-hospital patient transport, medical equipment transport, and organ delivery across regions. In addition, RAM could support search and rescue operations, emergency evacuation, or disaster recovery operations using available (and often underutilized) airports in remote areas. RAM operations could also be used to support Emergency Response and Disaster Recovery if transportation facilities become damaged or unavailable due to natural disasters or extreme weather events.
Cargo and Freight Delivery Mission	
Cargo / Freight Delivery	Transportation of heavy cargo, freight, on-demand commerce between airports, distribution centers, manufacturers and from retailers to consumers.

Source: Cohen et al, 2024.

3.4 Implementation Forecast

The FAA is pursuing a "crawl-walk-run" approach to AAM deployment. The approach recognizes that AAM will likely be deployed through integration with existing aviation operations and available infrastructure with only slight modifications. While the FAA envisions integrated AAM operations at one or more key locations by 2028, it may be possible that some aircraft may be certified for operation as soon as 2025 or 2026 and enter service before 2028. The FAA is working to support these initial efforts while developing a path for the implementation of more advanced concepts to support increased automation, an increased frequency of operations, and integration in the National Aviation System. The FAA's envisioned initiation of AAM operations by 2028 could provide additional opportunities in California as it hosts the 2028 Olympics in Los Angeles.

AAM operations are anticipated to reach maturity over a period of 20 to 30 years. Emerging technology will be the primary catalyst for infrastructure development and the identification of operational routes. The attributes that that will most influence the evolution of AAM routes and operation include:

- The use of crewed and uncrewed aircraft operations,
- Airspace integration and the pace of operation, and

- Available transportation and energy infrastructure.

3.4.1 Crewed and Uncrewed Operations

Many OEMs seek to develop crewed short takeoff and landing aircraft (STOL) and vertical takeoff and landing (VTOL) aircraft to enter service at the initiation of AAM operations. During near-term operations, crewed missions will operate in the National Airspace System essentially identically to the way conventional takeoff and landing aircraft and helicopters operate today, with minimal accommodations needed for unique attributes (e.g., VTOL aircraft reserve battery capacity). A mature AAM market is envisioned to operate primarily using uncrewed aircraft.

The transition from crewed to uncrewed operations will have significant implication for concepts of operation in the airspace and for infrastructure.

3.4.2 Airspace and Pace of Operations

Current airspace procedures and FAA flight rules are presumed to be sufficient and appropriate for early AAM services. Operators will be expected to:

- File a flight plan (as required for a specific operation).
- Communicate with FAA Air Traffic Control using a Very High Frequency radio.
- Use defined corridors and waypoints while enroute.
- Otherwise operate with the same FAA flight rules.

FAA procedural guidelines are contained in Aeronautical Information Manual, Section 4-1-9, Traffic Advisory Practices at Airports Without Operating Control Towers.

3.4.3 Visual Navigation and Existing Helicopter Routes

During the initial stage of AAM deployment, AAM operations are expected to follow similar procedures as current helicopter operations; operators will use defined helicopter routes and FAA's Visual Flight Rule airspace navigation. Significant government and industry efforts are underway to design dedicated AAM airspace and air traffic operations to support future uncrewed flight. The FAA and NASA refer to Urban Air Mobility Maturity Levels (UML) 1 through 4 (NASA, 2021).

Early operations will begin with UML-1 (current procedures), and UML-3 and UML-4 represent industry maturity, which become relevant in future years when the pace and density of AAM flights are expected to increase. Concepts under consideration to address increased operations include:

- Establishing designated AAM corridors,
- Identifying Cooperative Operating Practices that allow operators and third-party service providers to assume some FAA Air Traffic Control functions under FAA-approved rules, and
- Developing rules of engagement to integrate AAM corridors with other air traffic.

UML-4 will require infrastructure and services that are not required to initiate AAM operations in the near-term.

3.5 Other Considerations for Near-Term Operation

Both airspace and ground-side infrastructure will be required to support AAM. Since this study focuses on the development of a three-year statewide implementation plan to support near-term AAM operations, several assumptions were made, as presented in **Table 2**.

Table 2: Assumptions for Near-term Planning and Implementation of AAM Operations

Assumption	Description
Operations will be initiated with crewed aircraft and transition to uncrewed aircraft with increased market maturity.	Near-term AAM operations that transport people will be conducted primarily with onboard pilots (crewed), although one OEM (Wisk) plans to enter into service using remotely supervised aircraft without a pilot onboard (uncrewed).
Existing FAA airspace procedures will remain in force.	Existing FAA procedures and procedures for airspace design are sufficient. For UAM operations (for example at the 2028 LA Olympics), specific airspace design is needed to plan for electrically powered vertical takeoff routes to deconflict with commercial air traffic and other factors.

Assumption	Description
New Infrastructure is needed to initiate operations.	Airports, heliports, and new vertiports used for AAM operations must be equipped with infrastructure to store, swap, or charge batteries and to process passengers, provide firefighting capability, and manage additional aircraft in designated areas.
Medivac operators must be engaged to identify service volumes, routes, and facility locations.	To support potential vertical takeoff and landing medivac applications, medivac operators must be engaged to determine potential service volumes and priority facilities for operational testing. Potential considerations include the evaluation of potential facilities to ensure that they comply with the vertiport standards necessary to meet the anticipated service volume.
Fuel and Communication infrastructure must be assessed to support Regional Air Mobility (RAM) Operations.	The type of aircraft used for RAM Operations can vary according to fuel source, size, capability (distance and elevation), and crew use. Prior to establishing RAM operations, the availability of fuel charging/storage, communication infrastructure, and data services must be assessed. As noted above, the aircraft suited to this mission vary in their fuel source and use of remote crew.
Mid-term and long-term operations will likely require infrastructure investment.	Following initial operation, additional infrastructure investment will be required to attract private operators and enhance route development and third-party services. Such infrastructure will support the testing and certification of third-party services such as data communications and Providers of Service for Urban Air Mobility.

Source: Aura Systems and Mead and Hunt, 2023.

More specific infrastructure needs would be determined on a case-by-case basis to reflect the type of aircraft used, whether it is crewed or uncrewed, the level of maturity/scale of operations, the mission type and use case, and energy requirements.

4.0 INFRASTRUCTURE ASSETS

California is the third largest state in the U.S. and home to some of the nation's most diverse regions, terrain, and ecosystems. The State's diverse geography, communities, and statewide transportation planning needs were considered when evaluating existing infrastructure that could support forthcoming AAM operations. The following section:

- Summarizes California's multimodal transportation system,
- Considers AAM's role within that system, and
- Identifies potential infrastructure and the ability of the existing system to support forthcoming AAM implementation.

4.1 Statewide Transportation Planning

As envisioned, AAM will not serve as a standalone transportation mode; most proposed operators envision that initial operations will include a start point or end point at an existing airport. As operations increase, AAM will need to move people and goods to and from other transportation modes and facilities. To consider California's infrastructure readiness for AAM operations, AAM needs to be considered within the context of California's multimodal transportation system and assets.

4.1.1 California Transportation Plan 2050

The *California Transportation Plan 2050 (CTP 2050)* and its associated modal plans identify the State's transportation planning challenges and opportunities and recognize the increased risks associated with global climate change on the State's transportation infrastructure. The plan provides insights, goals, and proposed policies to reflect the State's multimodal transportation system—all of which must be considered to better understand the potential role of AAM in California's multimodal transportation system and the availability of existing infrastructure for near-term AAM use.

California's Diverse Geography

During the development of the California Transportation Plan 2050, Caltrans planners identified nine multi-county "super regions" to support discussions about regional trends and patterns across the state. The Super Regions offer a geographic focus for considering initial AAM route planning. **Figure 3** on page

24 identifies these super regions and their associated counties. California's population resides throughout the states in areas ranging from densely populated urban centers to remote rural and tribal areas. **Table 3** on page 25 presents some of the general transportation challenges and opportunities faced by urban, suburban and rural areas of the State.

Figure 3: California Super Regions

Source: Caltrans, 2021a

Table 3: Transportation Challenges and Opportunities by Geography

Geography	Challenges	Opportunities
Urban	• Housing availability and affordability • Gentrification and displacement of lower-income residents • Managing traffic, curb space, and right-of-way • Incompatible land uses, in some cases • Disconnected bike lanes/trails	• Land use planning that supports high-capacity transit and active travel • Increased demand for transit and active travel • Mobility as a Service (MaaS) and new mobility to improve transit access
Suburban	• Auto-oriented development patterns • Roadway congestion • Growing travel times • Limited access to travel • Limited access to bike lanes/trails	• Repurpose underutilized land uses (e.g., malls, parking lots) to support quality of life • Connected and Autonomous Vehicles (CAV) to improve safety • MaaS to improve transit access
Rural and Tribal	• Development encroachment into open space, agriculture, and natural habitats • Lack of travel options, both for people and freight • Travel conditions for bicyclists and pedestrians • Projects often uncompetitive for grant funding	• Technology to reduce the need for long-distance travel • Zero-emissions vehicles (ZEV) to reduce emissions • MaaS and new mobility as an alternative to transit • Streamlined interregional transit fares and transfers

Transportation Planning Goals, Challenges, and Trends

The plan also envisions a "safe, resilient, and universally accessible transportation system that supports vibrant communities, advances racial and economic justice, and improves public and environmental health for the state's residents," which are likely to reach a total of 45 million by 2045. **Table 4** on page 26 summarizes the statewide challenges and trends addressed by CTP 2050. To address the challenges, Caltrans developed eight broad, inter-related priorities

for the State's multimodal transportation system, each of which is supported by more specific objectives and goals. **Table 5** on page 27 identifies statewide challenges and trends that were identified during CTP 2050. The planning priorities identified by CTP 2050 must be considered when identifying goals, policies, and criteria associated with AAM planning, infrastructure, and operation.

Table 4: Statewide Challenges and Trends

Category	Challenges / Trends
Demographics	**Population increase:** The state population will grow by 20 percent by 2050 to reach 49 million residents. **An aging population:** Adults over 65 will comprise more than 25 percent of the population. **Changing travel preferences:** Car ownership and travel patterns will change.
Land Use	**Housing shortage:** Home buyers are moving to exurban areas in search of affordable housing, which will affect traffic patterns and densities. **Location of new growth:** Growth will occur in major urban areas, but low- and middle-income residents will continue to seek housing in less dense, more affordable places, thereby increasing the need to travel further to access jobs and services. Moreover, rural and suburban areas are likely to face growing development pressures to provide nearer jobs and services.
Climate Change	**Transportation and GHG:** Transportation remains the greatest source of GHG emissions (approximately 40 percent in 2016), and it is linked to climate change. Sea levels are expected to rise, resulting in flooding and infrastructure damage. **Carbon Reduction Targets:** Transportation must continue to address emissions reduction legislation. **Adaptation and Resilience:** Transportation planning efforts must address the preservation and adaptation of the State's transportation systems and infrastructure to climate change.

Category	Challenges / Trends
Social Equity	**Income Inequality**: One in seven Californians lives in poverty, and commute time has been cited as the single, strongest determinant of escaping poverty. **Racial Disparities**: In California, persons of color are twice as likely to ride public transit, experience longer commutes, and have fewer job opportunities than white, non-Hispanic persons. Pedestrian fatality rates are twice as high in Black communities than white, non-Hispanic communities. **Environmental Justice:** Low-income and minority households experience greater exposure to air pollution and congestion.
Quality of Life	**Improved Quality of Life:** Transportation planning can improve the quality of life for California residents through: • Active transportation options in our communities, and • Providing greater access to employment and other services.

Table 5: Correlation of System Goals and AAM Readiness Considerations

Planning Priority	Policy and Goals	AAM Infrastructure Readiness Considerations
Safety	**Provide a safe and secure transportation system.** 1. Eliminate fatalities and injuries on the transportation system. 2. Improve personal security and infrastructure security on the transportation system. 3. Improve emergency preparedness, response, and recovery on the transportation system	1. **Climate Vulnerability**. Do not provide new infrastructure in areas identified as vulnerable to natural disasters or extreme weather events. If necessary, include adaptation measures to enable operation during such emergencies. 2. **Risk management**. Provide for routes in locations that can respond quickly to areas with increased risk associated with natural disasters and severe weather events.

Planning Priority	Policy and Goals	AAM Infrastructure Readiness Considerations
Climate	**Achieve statewide GHG emissions reduction targets and increase resilience to climate change.** 1. Advance a clean, carbon neutral transportation system to meet GHG reduction targets. 2. Increase resiliency to the growing impacts to climate change by identifying infrastructure vulnerability and adapting our system to address them.	1. **Reduced Aviation Emissions.** Electric-powered engines will reduce air quality emissions; however, the energy source must remain sustainable to reduce GHGs and further air quality goals. Focus AAM infrastructure in areas that generate energy from renewable sources (not coal-fired plants). 2. **Provide service to vulnerable locations.** Provide infrastructure and service to offset infrastructure vulnerability.

Planning Priority	Policy and Goals	AAM Infrastructure Readiness Considerations
Equity	**Eliminate transportation burdens for low-income communities, communities of color, people with disabilities, and other disadvantaged groups.** 1. Improve transportation-related economic, environmental, and public health outcomes for disadvantaged communities. 2. Improve access to a range of high-quality, safe, and affordable mobility options within disadvantaged communities. 3. Support disadvantaged communities in playing an active and direct role in transportation decision making.	1. **Affordable transportation.** Provide an affordable transportation option to low-income and disadvantaged communities and include AAM as part of integrated transit routes. Identify routes that link job opportunities, housing, services, and education. 2. **Public Engagement.** Undertake targeted stakeholder engagement prior to decision making. Provide disadvantaged communities with an active and direct role in transportation decision making, especially decisions associated with route selection and infrastructure siting.

Planning Priority	Policy and Goals	AAM Infrastructure Readiness Considerations
Accessibility	**Improve multimodal mobility and access to destinations for all users.** 1. Increase access to destinations. 2. Increase the competitiveness of transit, shared mobility, and active transportation options. 3. Provide integrated and seamless travel connections. 4. Optimize system performance for all modes.	1. **Housing, Jobs and Services.** Provide transportation opportunities through AAM that improve access to jobs, services, educational opportunities, and more. 2. Provide a safe, affordable transportation option that links to other modes (air, rail). 3. Identify and provide opportunities to address gaps in the transportation network and reduce congestion.

Planning Priority	Policy and Goals	AAM Infrastructure Readiness Considerations
Quality of Life/ Public Health	**Enable vibrant, healthy communities.** 1. Expand access to healthy transportation options. 2. Reduce household transportation costs. 3. Improve transportation-related public health outcomes. 4. Support enjoyable trip experiences and vibrant public spaces.	1. Link AAM infrastructure to other, non-autocentric modes (biking, walking, transit). 2. Provide an affordable transportation option to low-income and disadvantaged communities. 3. Implement AAM-specific land use compatibility principles during route and infrastructure siting to reduce exposure to noise, safety risk, overflight, and airspace protection. 4. Provide infrastructure development guidance to create safe, inclusive, and inviting public spaces. 5. Provide opportunities that link to health care and other necessary facilities.

Planning Priority	Policy and Goals	AAM Infrastructure Readiness Considerations
Environment	**Enhance environmental health and reduce negative transportation impacts.** 1. Improve air quality and minimize pollutants from transportation. 2. Protect and enhance California's natural resources and ecosystems. 3. Protect and enhance California historic and cultural resources.	1. The introduction of electric-powered engines into the aviation fleet offers the potential to reduce air quality emissions; however, the energy source must remain sustainable to reduce GHGs and further air quality goals. Focus AAM infrastructure in areas that generate energy from renewable sources. 2. Site corridors, routes, and other infrastructure to avoid impacts to natural and cultural resources and their use by the public.
Economy	**Support a vibrant, resilient economy.** 1. Support diverse, equitable, and sustained economic growth. 2. Facilitate efficient, reliable, and sustainable goods movement. 3. Support local and regional economic development.	1. Support local and regional economic development and infrastructure through the use/reuse of underutilized transportation infrastructure in and near communities, such as general aviation airports and regional rail lines. 2. Provide links to freight/goods movement to decrease short-haul and remote delivery.

Planning Priority	Policy and Goals	AAM Infrastructure Readiness Considerations
Infrastructure	**Maintain a high-quality, resilient transportation system.** 1. Preserve and maintain existing multimodal transportation assets in a state of good repair. 2. Increase infrastructure resiliency to climate change and natural disasters. 3. Improve efficiency in transportation project delivery. 4. Secure sustainable, dedicated, long-term funding for the transportation system.	1. Support local and regional economic development and infrastructure through the use/reuse of underutilized transportation infrastructure in and near communities, such as general aviation airports and regional rail lines. 2. Engage in public/private partnerships. 3.

Source: Mead & Hunt, Inc.

4.1.2 Climate Action Plan for Transportation Infrastructure

CalSTA developed the Climate Action Plan for Transportation Infrastructure (CAPTI) through a collaborative process involving several state agencies as well as regional and local stakeholders. The plan acknowledges the effects of the global climate crisis in California, as evidenced by extreme heat and increased wildfire. CAPTI recognizes that the transportation sector is the largest contributor of GHG emissions statewide and responds to the urgent need to reduce transportation related GHGs.

CAPTI is a holistic framework and statement of intent for aligning state transportation infrastructure with state climate, health, and social equity goals. CAPTI identifies ten guiding principles, which are supported by strategies and associated action measures. Although CAPTI does not address aviation specifically, many of its guiding principles are applicable to aviation and AAM-related infrastructure development.

CAPTI's Guiding Principles

- *Building toward an integrated statewide rail and transit network centered around the existing California State Rail Plan.*
- *Investing in networks for safe and accessible bicycle and pedestrian infrastructure.*
- *Including investments in light, medium, and heavy-duty zero-emission vehicle infrastructure as part of larger transportation projects.*
- *Strengthening the State's commitment to social and racial equity by reducing public health and economic harms and maximizing benefits to disproportionately impacted disadvantaged communities, low-income communities, and Black, Indigenous, and People of Color communities by involving these communities early in decision making.*
- *Making safety improvements to reduce fatalities and severe injuries of all users towards zero.*
- *Assessing physical climate risk as a standard proactive for transportation infrastructure projects to enable informed decision making.*
- *Promoting projects that do not significantly increase passenger vehicle travel, particularly in congested urbanized settings.*
- *Promoting compact infill development by protecting residencies from displacement.*
- *Developing a zero-emission freight transportation system.*
- *Protecting natural and working lands from conversion to more intensified uses and enhancing biodiversity*

4.2 California's Transportation Assets

California's complex transportation system includes numerous transportation modes and their associated infrastructure that must be considered in relation to forthcoming AAM operations.

4.2.1 Aviation Assets

The *California Aviation System Plan 2020* (CASP 2021) is a component of CTP 2050 that provides a comprehensive overview of California's aviation system and assets. The CASP describes aviation facilities and infrastructure and the relationship between aviation and other transportation modes.

California has 241 public-use airports as well as numerous public and private heliports that contribute to the statewide transportation network. A total of 191 of the State's 241 public-use airports are included in the FAA's National Plan of Integrated Airport Systems and are eligible to receive federal funds. **Table 6** below summarizes California airports using the state's functional airport classifications, which vary slightly from the FAA's classification system. **Table 7** on page 36 presents the State's commercial service Airports as designated by FAA.

Table 6: Summary of California Public-Use Airports by State Classification

Airport Category and Description	Number of Airports
Commercial (Primary and Non-Primary) Primary and non-primary airports provide scheduled air service.	27
Metropolitan Located in urban areas with an emphasis on business, charter, and corporate flying; have a published instrument approach and a control tower; and provide flight planning facilities.	19
Regional Usually located in an area with a larger population base than Community airports, serve multiple cities or counties, support business and corporate aircraft activity, and have a published instrument approach.	69
Community Located near small communities or in remote locations and serve/generally support recreational flying, training, and local emergencies.	92
Limited Use Usually located in non-urban areas and may be used for a single purpose, such as firefighting. Airports do not include based aircraft or provide services.	33
Joint Use (Military and Civilian) Used by both military and civilian aircraft.	1
Total Airports	**241**

There are 23 primary commercial service airports included in the FAA's National Plan of Integrated Airport Systems, 16 of which are associated with major air cargo operations. The FAA's definition of primary airports, provided in 49 U.S.C.

Section 47102(16), is public airports receiving scheduled air carrier service with 10,000 or more enplaned passengers per year.

Table 7: California's Primary Commercial Service Airports with Cargo Operations

Airport Location (City/Nearest City	Airport and Code
Arcata/Eureka	California Redwood Coast-Humboldt Co. (ACV)
Bakersfield	Meadows Field (BFL)
Burbank	Bob Hope (BUR)
Concord	Buchanan Field (CCR)
Fresno	Fresno Yosemite International (FAT)
Long Beach	Long Beach-Daugherty Field (LGB)
Los Angeles	Los Angeles International (LAX)
Monterey	Monterey Regional (MRY)
Oakland	Metropolitan Oakland International (OAK)
Ontario	Ontario International (ONT)
Palm Springs	Palm Springs International (PSP)
Redding	Redding Municipal (RDD)
Sacramento	Sacramento International (SMF)
San Bernardino	San Bernardino International (SBD)
San Diego	San Diego International (SAN)
San Francisco	San Francisco International (SFO)
San Jose	Norman Y. Mineta San Jose International (SJC)
San Luis Obispo	San Luis County Regional (SBP)
Santa Ana	John Wayne Airport-Orange County (SNA)
Santa Barbara	Santa Barbara Municipal (SBA)
Santa Maria	Santa Maria Public (SMX)
Santa Rosa	Charles M. Schulz-Sonoma County (STS)
Stockton	Stockton Metropolitan (SCK)

Key: Highlighted cells identify airports that support major cargo operations.

Heliports

California's aviation system includes hundreds of private and special-use heliports. Typically, heliports are defined in two categories that are covered by private ownership: Special Use and Personal Use.

"Public-use heliports" are rare and not necessarily specified in an airport permit when located on airport property. Instead, it is more common to see heliports co-located on airports that are in use for tenant activities such as flight training or manufacturing, which means the heliport remains private-use, even if it is located on a public-use airport.

Airport Capacity

Aviation forecasts conducted by the FAA and the State in support of the current version of the California Aviation System Plan indicate the following:

- **Commercial Service:** Air carrier operations/passenger enplanements are projected to increase through 2045. The State's commercial airports have the capacity to address the forecasted passenger operations.
- **Air Cargo:** Fourteen of FAA's designated commercial service airports support provide Air Cargo operations. Although freight volumes were not forecasted for the *California Aviation System Plan 2020*, the *California Air Cargo Groundside Needs Study 2040* concluded that California airports have the capacity to meet the 2040 demand, although some infrastructure development or redevelopment will be needed. The capacity of California's largest airports appears to be sufficient to handle modest increases in freight movement in the near-term, and the importance of ground transport of freight to and from the airports is a key consideration.
- **General Aviation:** These operations are projected to increase at a comparatively lower rate.

4.2.2 Intermodal Freight Infrastructure

The *California Freight Management Plan* considers all transportation within the context of an integrated, intermodal freight network in accordance with federal freight transportation goals and CTP 2050 planning priorities.

Freight movement in California includes multiple modes that work together to provide resiliency through redundant freight corridors and mode choices

including maritime and air cargo, Class 1 freight railroads, and a strong logistics industry. The California Freight Management Plan recognizes that California's airports are an important component of this integrated freight transportation system, and airport operators must strike a balance to facilitate the efficient movement of passengers, freight, and related services, noting that more than 200 airports assist in domestic and international freight movement, primarily the transport of high-value, lightweight cargo.

While the capacity of California's largest cargo airports appears to be capable of accommodating modest increases in freight movement, the importance of ground transport of freight to and from the cargo airports is a key consideration. Many roads are in densely populated, high-traffic areas that are congested by passenger vehicles and were not designed to accommodate 53-foot trailers.

In recent years, California's transportation system has been augmented to include several important inland ports to link aviation with railroads and highways including the March Inland Port in Riverside County, the Ontario International Airport and San Bernardino International Airport in San Bernardino County.

4.2.3 Passenger Rail Infrastructure

California's freight rail network also accommodates the operation of passenger trains throughout the state. These operations include all state-supported routes (portions of the Pacific Surfliner, San Joaquin and Capitol Corridor routes) and the Amtrak long-distance train routes that operating in the state. Commuter services such as Metrolink, Caltrain, and the Altamont Corridor Express are critical to commuters. The passenger stations associated with these routes provide opportunities for the integration of AAM.

4.2.4 Highway Corridors and Associated Infrastructure

The Interregional Transportation Strategic Plan (ITSP), a component of CTP 2050, provides a policy framework to guide Caltrans and its partner agencies in developing comprehensive multimodal highway corridor plans. The ITSP aligns with the CAPTI and CTP 2050 goals and synthesizes data from other modal plans.

The ITSP identifies 11 Strategic Interregional Corridors that connect California's cities and regions and connect California to adjacent states and its international border with Mexico. These corridors are considered the most significant interregional travel corridors in California, and they are identified priorities for state transportation investment. The corridors are focused on interstate and state highways as they facilitate travel to, through and between geographic regions and include the following transportation facilities and components:

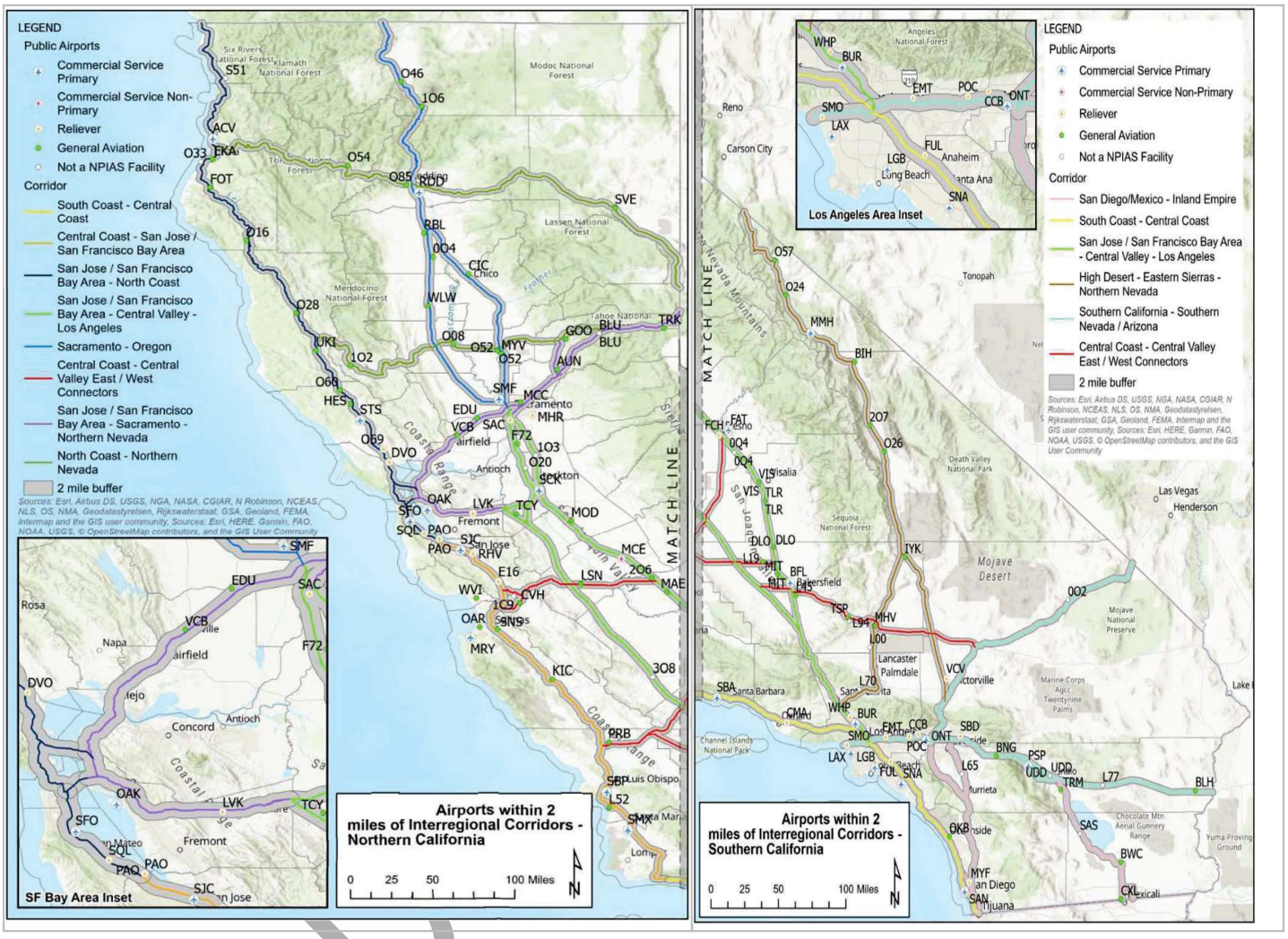
- Forthcoming California High-Speed Rail facilities
- Existing and proposed intercity passenger rail services
- Freight rail facilities
- Maritime Ports
- Inland Ports
- The State Highway System, which includes interstate highways, U.S. highways, and other state highways

Highways and Airports

Of California's 241 public-use airports, 115 are located within 2 miles of the State's 11 interregional corridors, as shown in **Figure 4** on page 40. However, only 35 of the 115 airports contribute to intermodal freight movement, and nearly all are commercial service airports. With the addition of AAM-related infrastructure, the remaining 80 airports may offer opportunities to contribute to AAM system development and improve efficiency of California's passenger and air cargo network.

Caltrans prepared an Interregional Transportation Strategic Plan (ITSP) addendum in 2023 that recognizes California's geographic regions and provides additional data pertaining to racial equity, public health, climate resiliency, and single-occupancy vehicle trip reduction. The data provided in the 2021 ITSP and 2022 addendum provide data that can be used to identify opportunities and challenges associated with incorporating AAM into the interregional corridors.

Figure 4: Public Use Airports within 2 miles of Interregional Corridors



Highway Corridors and Visual Navigation

Airspace, at any elevation, falls within the jurisdiction of the Federal government. This extends to the establishment of airspace corridors for AAM operations. However, it is worth noting that both fixed-wing and rotor aircraft have long used highway corridors to navigate using pilotage and dead reckoning with familiar, documented landmarks. Since roads are typically located in low terrain, they may provide suitable travel pathways for low-flying aircraft, even when Visual Flight Rule (VFR) conditions are marginal. eVTOLs are designed to be autonomous, operate between 400' to 4000' and likely require designated airspace corridors especially in the early stages of AAM deployment.

Consideration of airspace corridors to overlap highway corridors may offer advantages that extend to the strategic development of AAM as another mode of transportation.

Safety Roadside Rest Areas

Caltrans provides Safety Roadside Rest Areas (SRRAs) as part of the State Highway System that are essential to highway safety (see **Figure 5** on page 42). Caltrans' *Safety Roadside Rest Area (SRRA) Master Plan* summarizes existing SRRAs, identified alternative stopping opportunities, and provided recommendations to determine both the current and 20-year rest area system needs.

Under current Federal Regulations (14 Code of Federal Regulations, Section 91.3(b)), an aircraft pilot may deviate from any rule if required to address an emergency. That means in a true emergency (mechanical failure, medical emergency, fuel exhaustion, etc.), a helicopter pilot can legally land wherever it is necessary to protect life and property, including on public land, roads, or open spaces. California law (Public Utilities Code, Section 21403) provides a similar "forced landing" exception for aircraft, including helicopters.

As AAM emerges as part of California's multimodal transportation system, studies on the benefits of identifying, or establishing, a network of public spaces that may be suitable for emergency landings of eVTOLs, including SRRAs, may be worthwhile. Such studies would require local, State (Caltrans, California Highway Patrol, etc.), and federal agencies' input and engagement.

Zero-Emissions Charging Infrastructure

The United States Department of Energy's Alternative Fuels Data Center provides resources pertaining to the use of alternative and renewable fuels, including maps of alternative fueling stations by fuel and type that can be generated on a state-by-state basis (see **Figure 6** on page 12). In 2024, the California Energy Commission public count of electric vehicle charging stations shows 68,632 publicly owned Level 2 chargers and 15,639 Direct Current Fast Chargers. Direct Current Fast Chargers provides faster charging time than Level 2 chargers and may be better suited for AAM.

Figure 5: Location of Public Use Airports and SRRAs adjacent to CA's Interregional Roads

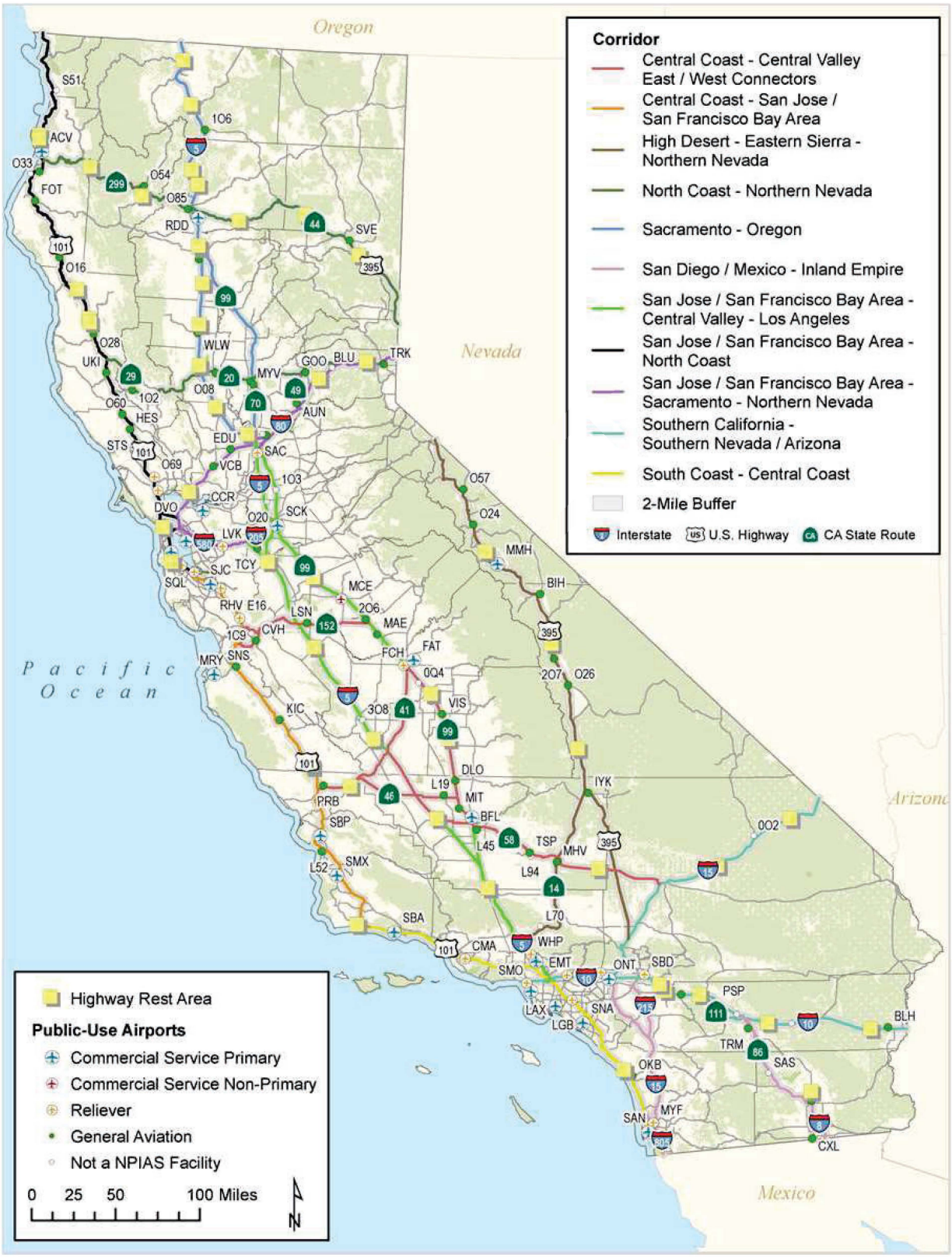


Figure 6: Zero Emissions Charging Stations and Airports along Interregional Corridors

California's interregional corridors currently include opportunities to fuel only surface vehicles, which does not provide any immediate benefit to AAM operations navigating over California's roadways. In addition, opportunities to include vertiports or vertipads at existing vehicle fueling stations may be limited based on size, safety considerations, and existing electric infrastructure capacity.

The U.S. Department of Transportation and U.S. Department of Energy worked collaboratively to create the Joint Office of Energy and Transportation, which published the *National Zero-Emission Freight Corridor Strategy* in March 2024 to prioritize investment, planning, and deployment for medium- and heavy-duty vehicle fueling infrastructure to advance zero-emission freight along the nation's corridors. Although the *National Zero Emissions Freight Corridor Strategy* focuses on the conversion of the nation's truck fleet, it provides opportunities for AAM as well. One of the goals of the strategy is to encourage public-private partnerships and the development of electrical infrastructure at the State's airports, freight rail facilities, and marine ports. The development of AAM facilities at these intermodal locations, shown on **Table 8** on page 45, all of which are linked to California's interregional highways, could facilitate the incorporation of AAM into the State's intermodal freight transport networks, bolster private development, and "advance transportation and infrastructure solutions that are better for freight movement, communities, the environment, and the economy".

Table 8: Proposed Zero-Emissions Freight Hubs in Phases 1 and 2 of the National Zero-Emission Freight Corridor Strategy

Proposed ZEV Infrastructure Type and No. of Facilities in CA	Locations
Intermodal Freight: Air-to truck (4 Airports)	Los Angeles International (LAX) Oakland International (OAK) Ontario International (ONT) San Francisco International (SFO)
Intermodal Freight Facilities Marine Roll-on/Roll-off (7 Marine Ports)	Port of Hueneme Port of Long Beach Port of Oakland Port of Richmond Port of San Diego Port of San Francisco Port of Los Angeles
Intermodal Freight Rail Facilities (29 Intermodal Rail Facilities)	Los Angeles, CA (4 locations) Commerce, CA (1 location) Lathrop, CA (1 location) Long Beach, CA (6 locations/piers) Oakland, CA (7 locations) Pasadena/Bayport Container Terminal (1 location) San Pedro, CA (2 locations) Stockton, CA (1 location) Terminal Island (5 locations) Wilmington, CA (1 location)
Principal Ports (4 ports)	Port of Long Beach Port of Los Angeles Port of Oakland Richmond, CA

5.0 INFRASTRUCTURE READINESS

California's existing multimodal infrastructure offers numerous opportunities to support forthcoming AAM operations, and many of these opportunities support the goals of CTP 2050.

5.1 Aviation System Readiness

Nearly all of California's airports are equipped to the three broad categories of emerging aircraft.

- Conventional takeoff and landing aircraft could operate at all the State's commercial service airports statewide and many of its general aviation airports, provided that they include a runway length of 3,000 feet.
- Short takeoff and landing aircraft could operate using any of the state's public-use airports.
- Vertical takeoff and landing aircraft have the potential to operate at any of the state's public use airports.

5.1.1 Airport Opportunities and Constraints

The relationship between California's public-use airports and its intermodal transportation system offers broad opportunities for AAM use:

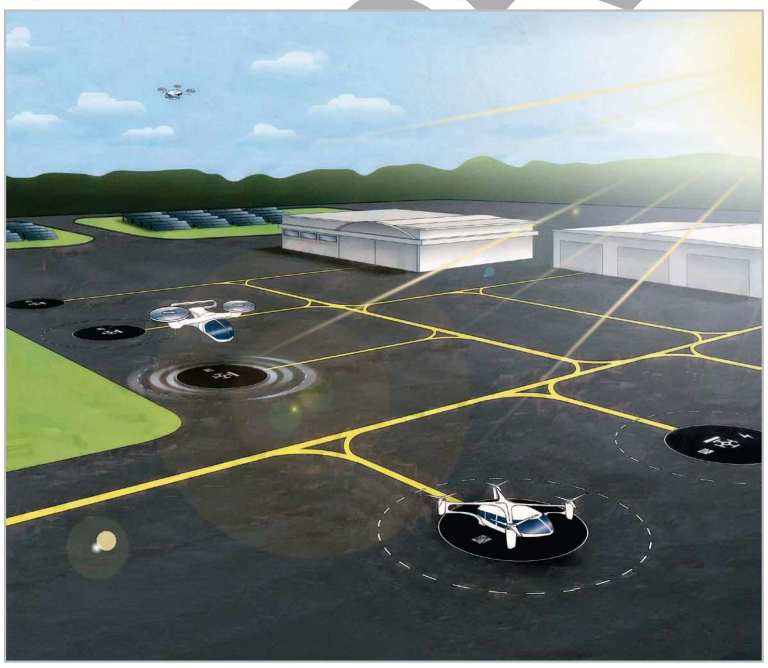
- **Existing Aviation Infrastructure:** California's public-use airports include pavements, hangars, parking areas, and other infrastructure to support AAM operations. The State's commercial service airports support initial use cases that focus on passenger transport between airports and nearby cities or other destinations.
- **Access:** As previously noted, most
- airports are located within 2 miles of a highway corridor, and all public use airports are within 5 miles of a highway corridor. The proximity to the State's interregional highway system could facilitate both passenger and intermodal freight use cases.
- **Communications Infrastructure:** Highway corridors frequently include communications infrastructure, which can support AAM operations at initiation and into the future.

- **Multimodal Opportunities:** Freight intermodal facilities are located at or adjacent to California's largest commercial service airports and largest inland ports.

Forthcoming AAM operations are likely to include the use of existing infrastructure during its first phase of operation, and existing airports and heliports have been proposed for vertiport development; however, the use of these facilities is limited by their location, size, and structural capability. Existing infrastructure, including runways, taxiways, instrument and visual procedures, and surveillance systems, can be used to support AAM operations.

Conventional takeoff and landing and short takeoff and landing aircraft can use available runways. In some cases, vertical takeoff and landing aircrafts may be able to use existing procedures and patterns to arrive and depart from an airport and either taxi or hover between a runway and a designated landing/parking area; however, many designs will not be capable of taxiing or will have limited taxiing capability based on design or power constraints. In some cases, existing parking or other paved apron areas could be repurposed to support parking, charging, and passenger loading (see **Figure 7** below).

Figure 7: Notional AAM Parking and Charging Areas Airport



Source: Mead & Hunt, 2024.

5.1.2 Commercial Service Airports

In the near term, AAM is envisioned to operate in urban areas with initial routes between cities and major hub airports.

Although California's commercial service airports have the capacity to absorb some amount of new passenger activity, AAM has not been included in passenger forecasts until very recently, and some airports may be constrained by available space to support the development of new facilities and increased energy consumption. In addition, vertiport design and placement decisions may affect the movement of passengers throughout the airport based on concerns associated with security screening or passenger transport facilities to connect AAM users to aircraft gates.

Potential challenges associated with the integration of AAM at commercial service airports include:

- Increased energy needs from energy providers.
- On-site charging infrastructure near to passenger loading/unloading areas.
- Additional aircraft parking and hangar areas (or fixed-base operators).
- Additional maintenance facilities to address AAM-specific needs (battery storage, recycling/waste management).
- Increased data and data security needs.
- Potential adaptation of passenger movement facilities to accommodate transport between vertiport locations and aircraft gates.
- Potential adaptation of airport access and parking areas to accommodate locations of AAM facilities and operations.
- Additional funding to support planning, design, and construction of new facilities.

Additional challenges may be associated with incident management. As of late 2024, the FAA is researching the unique aircraft rescue and firefighting needs associated with electric aircraft and battery systems. Available data suggest that these aircraft will not likely trigger the same firefighting requirements as those associated with FAA-certificated airports; firefighting response requirements may be developed based on state or local guidance.

5.1.3 General Aviation Airports

California's 191 general aviation airports provide opportunities for AAM that might not be available from commercial service airports. Some of these opportunities are already being realized; OEMs, such as Joby, Archer and Wisk, already rely on these airports to support functions such as research and development, manufacturing, and testing. OEM investments have led to privately funded airport investment and locally based employment opportunities. Potential opportunities offered by California's general aviation airports, particularly those located in suburban and rural areas, include:

- Increased capacity for AAM operations
- Increased energy needs from energy providers
- Available space for facility development
- Available space for on-site energy development, such as solar arrays and microgrid systems
- Proximity to interregional highway infrastructure (less than 5 miles)

The greatest constraint to these airports is associated with funding is that California's 191 federally obligated general aviation airports received only a fraction of the federal funding provided to its commercial service airports, and state funding is constrained by limited revenue amounts and sources.

5.1.4 Heliports

A recent study, An Introduction to Airport & Vertiport/Aircraft Compatibility, considered the dimensions of 6,886 U.S. heliports to determine whether the dimensions would be sufficient to provide the 50-foot controlling dimension identified for some of the largest proposed AAM aircraft. The result of the study indicated that less than 30 percent could provide a 50-foot controlling dimension. The study concluded that that larger vertical takeoff and landing aircrafts would be incompatible with many heliports, and the use of existing heliports will need to be considered on a case-by-case basis.

Caltrans records indicate that California includes 335 permitted heliports as summarized on the next page in **Table 9** on page 50, and it is possible that some of these heliports may be used in the early stages of AAM operations.

Table 9:Permitted Heliports in California by Category

Category	Number of Permitted Heliports
Hospitals	168
Law Enforcement	34
Other Government Facilities	12
Public Utilities	37
Corporations	76
Private Property Owners	8
Total	**335**

5.2 Surface Transportation Infrastructure

As described in Section 3, California's integrated surface transportation infrastructure includes connections among airports, railroads, marine ports, and inland ports, many of which are already equipped with reduced- or zero-emissions infrastructure.

5.2.1 Opportunities and Constraints

Although near-term AAM operations will likely focus on air taxi and airport shuttle use cases, the proximity of California's interregional highway corridors presents opportunities to support these use cases that originate or land at an airport. Opportunities include:

- The presence of communication infrastructure adjacent to highways to support AAM operations.
- The identified locations for ZEV charging infrastructure and ongoing development of electrical and hydrogen fuel infrastructure adjacent to highway corridors.
- Established visual flight rule routes along highway corridors.
- Potential opportunities on or adjacent to roadways for controlled emergency landings.
- Potential development of vertiports/vertipads at highway safety areas.

- Potential opportunities for AAM as a new market participant in statewide efforts such as the market development for one of the Department of Energy's Regional Clean Hydrogen Hubs led by GO-Biz and the Alliance for Renewable Clean Hydrogen Energy Systems.

Potential opportunities that may be associated with regional air mobility, cargo, and emergency transport include the introduction of AAM at existing intermodal freight (air-to truck facilities) at existing airports:

- Los Angeles International (LAX)
- Oakland International (OAK)
- Ontario International (ONT)
- San Francisco International (SFO)

Additional opportunities are associated with the *National Zero-Emission Freight Corridor Strategy*, which encourages public-private partnerships and the development of electrical infrastructure at the state's airports, freight rail facilities, and marine ports that received federal funding for electrification efforts. The development of AAM facilities at these intermodal locations, all of which are linked to California's interregional highways, could facilitate the incorporation of AAM into the state's intermodal freight transport networks, bolster private development, and advance transportation and infrastructure solutions that are better for freight movement, communities, the environment, and the economy.

Constraints

Unlike aviation infrastructure, most surface and intermodal transportation facilities are not equipped to support aircraft operations including those required by forthcoming AAM operations. In addition, the presence of associated infrastructure, such as tall cranes, and spatial constraints associated with marine and rail freight transfer could reduce opportunities for the development of AAM infrastructure.

Funding Sources and Approvals

Significant infrastructure investment would be required by federal agencies, including the Federal Highway Administration, Federal Transit Administration,

Federal Railroad Administration, and others, to approve and provide support to AAM use. Long-term coordination may be required as these agencies are typically funded separately and bound by different laws and regulations. The use of different funding sources and the need to navigate approval processes from multiple regulatory agencies could pose challenges.

6.0 REGULATIONS AND APPROVALS

6.1 Federal Regulations and Guidance

AAM operations will be implemented and grow over decades; initial operations will likely include the use of new vertical takeoff and landing aircraft that will be certified to operate within the established regulatory and operational environments associated with civil aviation (i.e., operate primarily at existing airports and heliports) and increase by geographic coverage and operational frequency over time.

The FAA's Concept of Operations 2.0 envisions AAM maturity as a system that is characterized by new operational rules, new infrastructure, and a high degree of automation. At its initiation, AAM will require the use of vertiports — designated areas or structures used for the takeoff and landing of vertical takeoff and landing aircraft, many of which will be located at airports. However, vertiport development is anticipated to be collocated with or adjacent to other transportation facilities including:

- Transit Centers
- Heliports
- Passenger Rail Stations
- Marine Ports
- Inland Ports
- Park and Ride Facilities

The FAA suggests that the term "vertiports" should be used as a collective term to represent "a diverse system of public and private vertiports and vertistops to support passenger and cargo operations for aircraft operating under [Vertical Flight Rules] VFR, [Instrument Flight Rules] IFR, and [Autonomous Flight Rules] AFR". The FAA and NASA have considered the technical aspects of vertiport development, such as required dimensions, components, and associated infrastructure. Academic institutions and researchers have considered criteria and techniques that can be applied to vertiport siting, the potential effect of vertiport siting on existing communities, and needed revisions to existing regulatory, planning, and policy frameworks.

The following sections summarize Applicable FAA regulations and guidance associated with vertiport siting.

6.1.1 FAA Reauthorization Act of 2024

In May 2024, President Biden signed House of Representatives (HR) Bill 3935 into Public Law as the FAA Reauthorization Act of 2024 (Public Law 118-63). The Act includes a significant focus on AAM and addresses AAM in the following sections:

- **Sec. 951:** Definitions
- **Sec. 952:** Sense of Congress on FAA Leadership in AAM
- **Sec. 953:** Application of National Environmental Policy Act of 1969 (NEPA) categorical exclusions (CATEX) for vertiport projects
- **Sec. 954:** AAM Working Group amendments
- **Sec. 955:** Rules for operation of powered-lift aircraft
- **Sec. 956:** Advanced propulsion systems regulations
- **Sec. 957:** Powered-lift aircraft entry into service
- **Sec. 958:** Infrastructure supporting vertical flight
- **Sec. 959:** Charting of aviation infrastructure
- **Sec. 960:** AAM infrastructure pilot program extension
- **Sec. 961:** Center for Advanced Aviation Technologies
- **Sec. 1041:** Definitions
- **Sec. 1042:** Interagency working group
- **Sec. 1044:** FAA unmanned aircraft system and AAM research and development
- **Sec. 1045:** Partnerships for research, development, demonstration, and testing. (Public Law 118-63)

6.1.2 Engineering Brief No. 105 Vertiport Design

FAA Engineering Brief No. 105 (EB 105), *Vertiport Design*, provides design guidance for both the modification of existing helicopter/airplane landing facilities to accommodate vertical takeoff and landing (VTOL) aircraft and for the development of new vertiports/vertistops. EB 105 specifically addresses vertical takeoff and landing aircraft powered with electric motors and distributed electric propulsion, in contrast to propulsion systems built solely around an internal combustion engine. The FAA clearly states that the guidance was developed to present a "prescriptive and conservative approach" in the absence of validated vertical takeoff and landing aircraft performance data.

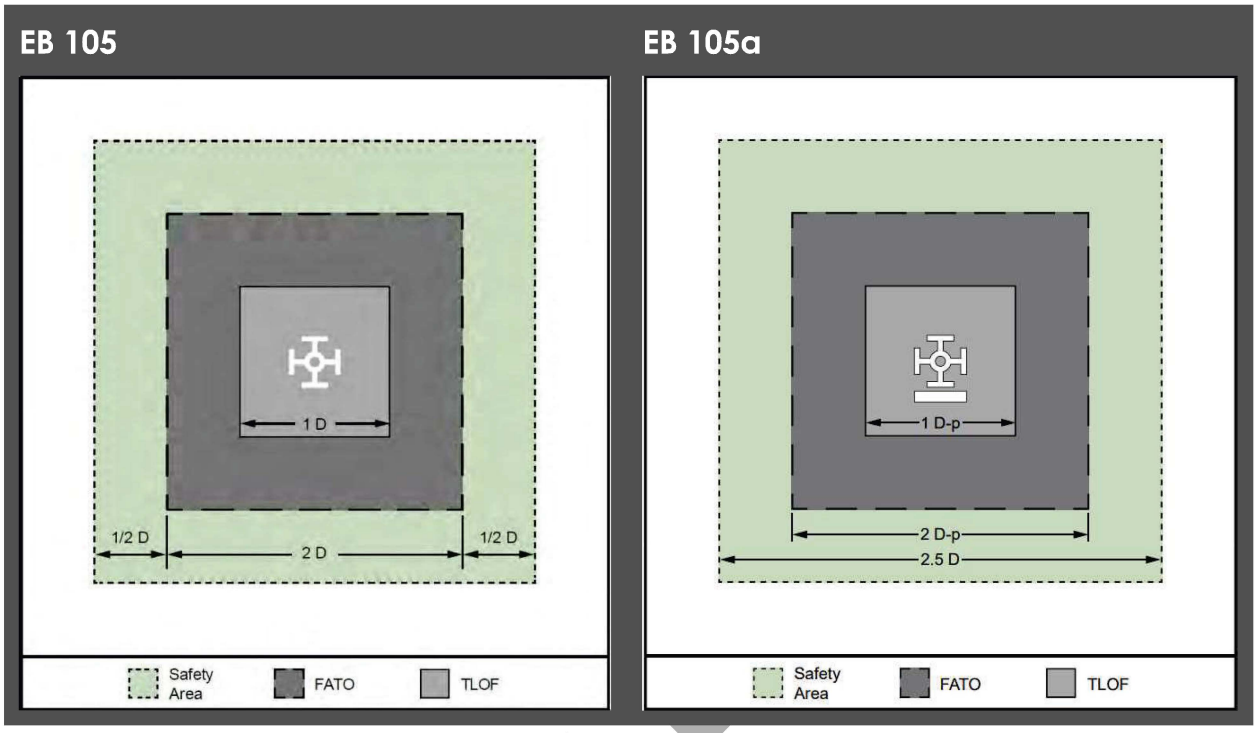
As shown in **Figure 8** on page 56, and as described in EB 105, vertiport design includes three important dimensions:

- **Takeoff and Liftoff Area (TLOF):** The load-bearing surface centered on the final approach/takeoff area.
- **Final Approach and Takeoff Area (FATO):** The load-bearing area over which the aircraft completes the final phase of approach to hover or land and from which it takes off. Two ingress/egress paths are required.
- **Safety Area (SA):** Defined area surrounding the FATO intended to reduce the risk of damage to aircraft accidentally diverging from the FATO.

The Engineering Brief also provides guidance for additional vertiport components including charging infrastructure, battery swapping capacity, maintenance, repair and overhaul services, Aircraft Rescue and Firefighting facilities, and high-speed data requirements.

The FAA released an update to EB 105 in December 2024. The revision (EB 105A) includes four changes that would substantially alter vertiport design.

Figure 8: Vertiport Design, Relationship and Dimensions of the TLOF, FATO, and SA



Source: FAA, 2022 and FAA, 2024a.

Unlike EB 105, EB 105A focuses on performance-based landing geometry and creates a subset of the controlling dimension (D in the figure above) related to just the propulsion devices. Whereas D is the diameter of the smallest circle enclosing of the entire vertical takeoff and landing aircraft projections, D-p (noted in the figure above) is the smallest circle enclosing just the propulsion units. The geometry of the touchdown and liftoff area (TLOF in the figure above) and final approach and takeoff area (FATO in the figure above) are now related to the D-p rather than D. Three other important changes are associated with EB 105A, include differentiating aircraft by powered-lift and non-powered-lift attributes, a new discussion on electric vertical takeoff and landing parking, and the inclusion of a new downwash/outwash caution area.

Other Considerations

In addition to these ground-based dimensions, vertiport development must also consider imaginary surfaces as set forth in Title 14 of the Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (also referred to as "Part 77").

6.1.3 FAA Advisory Circular 150/5190-4B, Airport Land Use Compatibility Planning

Airport-compatible land uses are defined as "those uses that can coexist with a nearby airport without constraining the safe and efficient operation of the airport or exposing people living or working nearby to potential negative environmental or safety impacts." Incompatible land uses are uses that can affect current or future airport operations or expose people to aircraft noise or safety risks.

Since the rise of commercial aviation in the 1950s, federal guidance has sought to separate airports and population centers in an effort to prevent nuisance and to reduce the number of people potentially affected by aircraft operations. Based on this early guidance, many commercial service airports were constructed in locations that were outside of urban centers. However, AAM air taxi and shuttle uses would operate within urban centers.

The FAA developed FAA Advisory Circular (AC) 150/5190-4B, *Airport Land Use Compatibility Planning*, to help state, county, and local governments improve compatible land use planning to prevent the creation of problematic land uses and to protect and preserve valuable aviation infrastructure and airport approach and departure areas. Caltrans Division of Aeronautics uses the AC to develop its guidance for Airport Land Use Commissions entitled *Airport Land Use Planning in California Handbook*.

The AC 150/5190-4B identifies six issues to evaluate when evaluating the compatibility of a specific land use with aviation:

- Aircraft Noise Exposure
- Airspace
- Visual Obstructions
- Wildlife (including protected species)
- Protection of People and Property
- Development Density (FAA, 2022b).

Although the FAA can require federally obligated airports to address land use compatibility as a condition of funding, it cannot regulate local land use or make local land use decisions. Only state and local laws, policies, and

regulations can affect local decision making. FAA guidance is provided to state and local agencies to assist them in the development of compatible land use during airport and community planning and decision making.

6.1.4 National Environmental Policy Act of 1969

The National Environmental Policy Act of 1969 (NEPA) "requires Federal agencies to assess the environmental effects of their proposed actions prior to decision making." NEPA is often referred to as an "umbrella law" because it serves as a framework that outlines the multiple laws and regulations that could apply to a proposed federal action.

The federal agency responsible for carrying out a federal action through funding or approvals is responsible for complying with NEPA. For an aviation action or project, the FAA serves as the lead Federal Agency to implement environmental analyses in accordance with NEPA, and the airport owner would serve as the project sponsor. For projects that involve multiple federal agencies, one agency may be designated to supervise the preparation of environmental analysis, or the agencies may act as joint lead agencies.

The FAA would serve as the lead Federal Agency for proposed projects that occur on federally obligated airports (i.e., airports that receive federal funds). NEPA would apply to proposed projects that would modify an Airport Layout Plan, such as the construction or modification of facilities on airport property. Proposals to construct a vertiport, vertistop, and associated equipment on airport properties would be required to comply with NEPA and FAA regulations implementing NEPA.

Projects Involving other Federal Agencies

Since different agencies have different regulations implementing NEPA, a vertiport or vertistop constructed at another federally obligated facility, such as a transit station, intermodal rail facility, or marine port, could be subject to NEPA in accordance with multiple lead agencies, such as the Federal Transit Administration, Federal Railroad Administration, or Maritime Administration, and applicable state and local environmental laws and regulations.

6.1.5 Anticipated Federal Authorizations for Vertiport Development

Although the federal permits and authorizations required to develop vertiports and AAM infrastructure in non-airport locations are somewhat unknown, some conclusions can be drawn regarding likely permit requirements and approvals associated with the construction of a new vertiport and proposed AAM operations at a federally obligated airport. The following FAA reviews and/or approvals would likely be required:

- FAA Form 7480-1, Notice of Landing Area Proposal, to establish a new vertiport that would not be associated with a current landing area.
- FAA Airspace Determination following Form 7480, Notice of Landing Area Proposal.
- NEPA compliance to support Airport Layout Plan (ALP) modification and proposed AAM operations.
- ALP approval showing location of proposed Infrastructure and equipment.

6.2 State Regulations and Approvals

As set forth in Division 9 of the California Public Utilities Code (PUC), Sections 21001 *et seq*., the State Aeronautics Act (SAA) seeks to further and protect the public interest in aeronautics and aeronautical progress. Article 3 of the SAA, *Regulation of Airports*, addresses the role of Caltrans and local agencies in permitting new and amended airport sites (PUC Section 21662, 2024), including emergency service helicopter sites and the location of helicopters in proximity to certain schools. PUC Section 21661.4 specifically addresses permitting for the construction of a new or expanded airports, and Article 3.5 refers specifically to the role of the state and local agencies in the establishment of Airport Land Use Commissions and their roles (PUC Section 21670 et seq., 2024).

6.2.1 Facility Siting and Permitting

The State Aeronautics Act grants Caltrans the authority to issue airport site approval permits, amended airport site approval permits, airport permits, and amended airport permits (PUC Section 21662, 2024). It is unlawful for local agencies to operate an airport unless an appropriate airport (or heliport) permit has been issued by Caltrans and has not subsequently been revoked (PUC Section 21663, 2024). The only exception applies to public safety agencies authorized to arrange for emergency medical services, which may designate

an area for the takeoff and landing of an emergency service helicopter in accordance with established regulations (PUC Section 21662.1, 2024).

It is anticipated that Caltrans will be responsible for vertiport siting and permitting in the same way that it is responsible for reviewing and approving proposed airport/heliport sites and issuing airport/heliport permits. It is also anticipated that vertiport site review and permit processes will be the same as or parallel to those currently in place for airports and heliports in accordance with the SAA, state guidance, and applicable federal regulations and guidance. The following paragraphs and **Table 10** provide an overview of Caltrans' existing heliport siting and permitting processes and the potential considerations or changes that may be required to incorporate vertiports into the existing process.

New Facilities: Site Approval and Permit Issuance

California regulations require political subdivisions or persons planning to "construct, establish or expand a heliport" to submit a permit application and obtain approval from Caltrans (PUC Section 21664, 2024). Based on the data provided by the applicant, Caltrans would issue an operating permit for the proposed facility with any necessary conditions.

Obtaining an operating permit for a new heliport is a two-part process:

- **Site Approval:** Focuses on the design and location of the proposed facility. Prior to submitting the required Caltrans form DOA-0201, *Heliport Siting Approval Permit Application*, the project proponent must:
  - Develop a detailed heliport design,
  - File FAA form 7480-1 and obtain an FAA Airspace determination,
  - Submit the proposed project and receive action from the local Airport Land Use Commission, and
  - Demonstrate compliance with CEQA.
- **Permit Issuance:** Caltrans will review the Heliport Siting Approval Permit Application to determine whether the site meets or exceeds minimum standards for design, provides for safe air traffic patterns and approach zones, and provides sufficient advantages to the public to outweigh any environmental disadvantages/consequences. Caltrans may impose reasonable permit conditions to ensure compliance with the State Aeronautics Act (PUC Section 21666, 2024).

While it is likely that new vertiports will be subject to the same permitting requirements as airports or heliports, additional considerations may be necessary based on the type of operations or use cases proposed. For example, use cases that would require co-location with other transportation facilities might need to consider additional regulations set forth by the Federal Transit Administration or Federal Rail Administration.

Existing Facilities: Vertiports at Existing Airports and Heliports

A separate heliport permit is not required for a designated heliport located within the boundaries of a permitted airport if the heliport meets heliport design standards described in the California Code of Regulations (CCR, 2024 - Title 21, Sections 3525 to 3560). However, Caltrans must review and approve the proposed heliport. In the case of a proposed vertiport, a permit amendment would likely be required to address proposed modifications to the heliport to accommodate electrically powered vertical takeoff aircraft and operations.

Potential Exemptions

The California Code of Regulations (CCR) identifies the types of heliports exempt from State Heliport Permit requirements; it may be possible that some exemptions available to heliports could be extended to vertiports associated with the following specific uses or conditions:

- *Vertiports owned or operated by the United States government.*
- *Agricultural vertiports – vertiports restricted to use only by agricultural aerial applicator aircraft (CFR Part 137 operators).*
- *Seaplane landing sites (for helicopters).*
- *Vertiports established on offshore oil platforms.*
- *Temporary vertiport landing sites that are not within 1,000 feet of the boundary of a public or private school maintaining kindergarten classes or any classes in grades 1 through 12 (see California Heliport Definitions).*
- *Emergency medical services landing sites (see California Heliport Definitions).*
- *Emergency use facilities (CCR, 2024).*

State Permitting and Review Considerations

As previously stated, permitting processes for vertiports have not been determined at this time, but it is reasonable to assume that they will follow existing permitting processes for heliports; however, modifications may be required to consider specific use cases, operational considerations, and infrastructure locations.

6.2.2 Airport Land Use Compatibility Planning

The FAA requires federally obligated airports to comply with its guidance pertaining to compatible land use as a condition of federal funding through grant assurances. While Caltrans cannot regulate local land uses, it provides guidance to states and local agencies for developing compatible land use regulations and policies. California's State Aeronautics Act (SAA) requires the creation of Airport Land Use Commissions (ALUCs) to conduct airport land use compatibility planning. ALUCs are established for two purposes:

- To ensure the orderly expansion of airports
- To ensure the adoption of appropriate land use measures that minimize the public's exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses (PUC Section 21670).

According to the SAA, although ALUC formation may vary, state laws require the creation of an ALUC in every California county that has a public-use airport.

Airport Land Use Compatibility Plans

Each ALUC is required to prepare, maintain, and adopt an Airport Land Use Compatibility Plan (ALUCP) to promote the development of compatible land uses within the vicinity of a public-use airport using the guidance set forth by Caltrans in the *California Airport Land Use Planning Handbook*, which reflects the FAA's land use compatibility guidance. The plan may include land use measures specifying land use, height restriction, and building standards that apply only with an airport-specific Airport Influence Area.

Government code Section 65302.3 states that a county or city's general plan (including specific plans) "shall be consistent" with the ALUCP. If the Airport

Land Use Commissions (ALUC) determines that such plans are inconsistent, the local agency must reconsider its plan or overrule the ALUC following a two-thirds vote by the local agency's governing body and specific findings to demonstrate that the proposed plan or action meet the intent of the SAA and other case law.

The State Aeronautics Act (SAA) identifies the types of land use actions that must be referred to an ALUC for a determination of consistency with the applicable ALUCP prior to their approval by a local agency including:

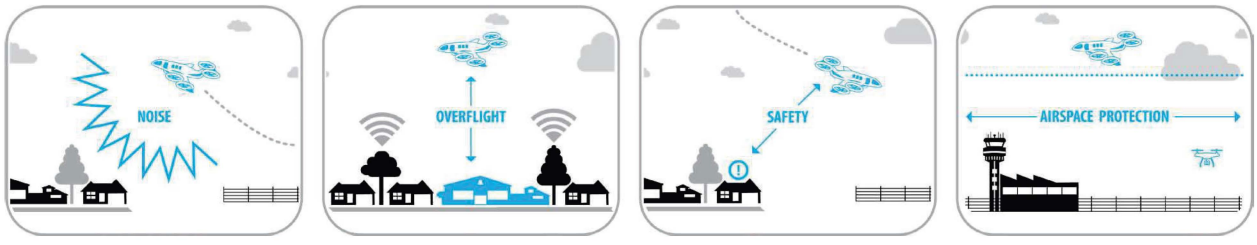
- Adoption or modification of an airport master plan for an airport included in the ALUCP (PUC Section 21676(c)).
- Any proposal for airport expansion, if such expansion will require an amended Airport Permit from the State of California (PUC Section 21664.5).
- Any proposal for construction of a new airport or heliport (PUC Section 21661.5).

Since a heliport is considered an airport under the SAA, it seems likely that the construction of a new vertiport or the modification of an existing aviation facility to support vertiport operations would trigger the need for a new or modified Airport Land Use Compatibility Plan.

Compatibility Concerns

The California Airport Land Use Planning Handbook provides guidance for four types of compatibility concerns that generally coincide with federal guidance as summarized in **Table 10** on page 65. Compatibility zones reflect the geographic areas associated with these compatibility concerns (see **Figure 9** on page 63).

Figure 9: Compatibility Concerns



Source: Mead & Hunt, Inc. 2024.

Although electrically powered vertical takeoff aircraft may operate differently than conventional aircraft, AAM-related compatibility concerns will need to be addressed. For example, aircraft may be comparatively quieter during flight and pose fewer conflicts, but low-level flight may pose overflight and safety concerns to communities—especially during the early stages of operation. In addition, the methods used to identify land use compatibility may require modification to consider OEM and land use compatibility.

Table 10: Compatibility Concerns Identified in the California Airport Land Use Planning Handbook

Compatibility Issue	Concern	Objective	Metric
Noise Exposure to noise attributable to aircraft operations.	Disruption of human activities.	Avoid new noise sensitive uses in areas exposed to aircraft noise.	Noise level measurements using California Noise Equivalent Levels.
Overflight Annoyance and other general concerns arising from routine aircraft flight over a community.	Annoyance to those living and working in the airport vicinity.	Alert buyers and renters to airport presence prior to purchase or lease; increase awareness of airport presence in the community.	Frequency of overflight and single-event noise levels.
Safety The protection of people on the ground and in the air from accidents.	Risk to people and property.	Limit density/intensity of land use (number of people) and risk-sensitive land uses near runway ends and within designated portions of the Airport Influence Area.	Historical national aircraft accident location data.

Compatibility Issue	Concern	Objective	Metric
Airspace Protection Protection of airspace from hazards to flight.	Hazards to flight from physical and visual obstructions, electronic interference with navigation, and wildlife attractants.	Avoid new hazards in navigable airspace.	Imaginary Surfaces as defined by 14 CFR Part 77 and other FAA-defined criteria, proximity of wildlife attractants to navigable airspace.

6.2.3 California Environmental Quality Act

Similar to NEPA, the California Environmental Quality Act (CEQA) is an "umbrella law" that "requires state and local agencies to inform decision makers and the public about the potential impacts of proposed projects, to reduce those environmental impacts to the extent feasible." CEQA will apply to proposed vertiports that require a discretionary approval by a local governing body or require the use of state or local funds. Although NEPA and CEQA can be undertaken concurrently, separate agency approvals are required. The lead agency under CEQA is the agency that will carry out a proposed project, such as a city, county, or special district, even if the project is proposed (sponsored) by others.

CEQA Process for Vertiport Construction and Operation

At its initiation, AAM is envisioned to include an existing airport as an origin or destination point; however, the construction or modification of an existing heliport to support AAM operations, new vertiport construction located outside of an airport, or the construction of a vertiport that requires the use of state or local funds will be subject to CEQA. Private entities proposing vertiport facilities and AAM operations will be required to obtain CEQA approval from the lead agency (e.g., the city or county where the infrastructure is proposed).

As identified in CEQA statutes and guidance, specific environmental resource issues/areas must be addressed during CEQA environmental review. Key analyses that are likely associated with the construction and operation of new vertiports include: Air Quality, Land Use/Planning, Noise, Population/ Housing, Socioeconomics, Transportation, and Utilities.

7.0 FUNDING AVAILABILITY

California's public-use airports contribute substantially to the state's economy, and the ongoing maintenance and improvements to the state's aviation assets are critical to both the economy and the quality of life for California residents. Traditional and new funding sources will be required to support forthcoming AAM operations.

7.1 Federal Funding Sources

7.1.1 FAA Airport Improvement Program Grants

The most common source of federal aid for public-use airport facilities is the FAA's Airport Improvement Program (AIP). AIP funds are distributed to public-use airports included in the National Plan of Integrated Airport Systems. Federal AIP grants are distributed to airports through entitlement grants or discretionary grants.

- **Entitlement grants:** Are apportioned to airports by formula. FAA-designated primary airports receive at least a $1 million entitlement annually if Congress appropriates $3.2 billion or more to the AIP. Nonprimary airports, receive a nonprimary entitlement of $150,000 annually.
- **Discretionary Grants:** The FAA awards discretionary grants on a competitive basis for individual projects based on their importance to the national air transportation system. AIP grants may be used to fund eligible airfield improvements, terminal projects (for non-hub airports), airport roadways, land acquisition, noise mitigation, and safety and security systems and equipment.

The FAA Reauthorization Act of 2024 identifies $4 billion for the FAA's AIP to account for fiscal years 2025 through 2028 (Public Law 118-38).

7.1.2 Infrastructure Investment and Jobs Act

The 2021 Infrastructure Investment and Jobs Act, otherwise known as the Bipartisan Infrastructure Bill (BIL) to rebuild America's infrastructure, totals $1.2 trillion, including $550 billion in new spending above baseline levels. The bill provides funding to support the following activities related to AAM:

- Improving transit facilities and access.
- Providing clean power infrastructure and electric vehicle (EV) charging sites.

- Strengthening supply chains through improvements to airports and ports.
- Investing in underserved communities or those that have been left behind.

The law allocates $25 billion for airport improvements to provide repairs, reduce congestion, and support the use of low-carbon technologies. The program includes funding for three FAA Programs:

- **Airport Infrastructure Grant Program:** Includes any project eligible for the Airport Improvement Program or Passenger Facility Charge. The program makes $2.89 billion in formula allocations available each year from fiscal years 2022 through 2026.
- **Airport Terminal Program:** Includes funds for terminal development; on-airport rail access; or relocating, repairing, or improving an Air Traffic Control Tower (ATCT). The program makes $970 million available each year from fiscal years 2022 through 2026.
- **FAA Contract Tower Competitive Grant Program:** Includes funding for repairing, improving, or replacing an ATCT, or acquiring equipment. The Program provides $20 million in competitive grants per year from fiscal years 2020 through 2026.

7.1.3 United States Department of Agriculture Rural Development – Community Facilities Direct Loan and Grant Program

The United States Department of Agriculture (USDA) Rural Development's Community Facilities Direct Loan and Grant Program provides affordable funding to public bodies, community-based nonprofit corporations, and federally recognized tribes to develop essential community facilities in rural areas. The program defines an essential community facility as "a facility that provides an essential service to the local community for the orderly development of the community in a primarily rural area and does not include private, commercial, or business undertakings".

Examples of essential community facilities include:

- Public facilities, including airports.
- Educational services.
- Healthcare facilities.

- Community support services (childcare, community centers, transitional housing).

Several types of airport capital projects can be financed through funding under the program, including terminals, hangars, runways, parking areas, roadways, curbside improvements, and administrative facilities. The program offers funding through low interest direct loans, grants, and a loan guarantee program.

7.2 State Funding Sources

Caltrans provides grants and loans to fund airport projects for safety, maintenance, and capital improvements as well as for the preparation of Airport Land Use Compatibility Plans through the California Aid to Airports Program (CAAP). The State excise tax on general aviation fuel is the department's primary source of revenue to fund and maintain its grant programs. Aviation gasoline is taxed at 18 cents per gallon and general aviation jet fuel at 2 cents per gallon in accordance with the Revenue and Taxation Code. Prior to the 2009 fiscal year, revenues averaged approximately $7.5 million annually but have steadily declined and are projected to be at $6.2 million for Fiscal Year 2024-25. The advent of Sustainable Aviation Fuels and aircraft electrification will likely cause revenues to decrease further.

Caltrans operates several grant programs that are similar to the FAA's Airport Improvement Program (AIP), as described below.

7.2.1 State Annual Credit

A total of 149 general aviation airports are eligible to receive a $10,000 annual entitlement grant for airfield maintenance and construction projects and land use compatibility planning. Airports are eligible for grants based on airport classification. The general aviation designated airports eligible for this grant may fluctuate as the FAA reclassifies airports.

7.2.2 AIP Matching Grant

Caltrans can provide an AIP Matching Grant to assist an airport sponsor in meeting the local match requirement associated with an AIP grant from the FAA. Caltrans provides a match up to five percent of the sponsor's AIP grant.

Only non-commercial airports identified in the National Plan of Integrated Airport Systems are eligible for the AIP Matching Grant.

7.2.3 Acquisition and Development Grant

The Acquisition and Development (A&D) program provides state grants to eligible, publicly owned, public-use airports for planning, construction, and land acquisition. Funding for A&D grants is provided through any funds remaining after Annual Credits and AIP Matching Grants are programmed and are subject to allocation by the California Transportation Commission.

A&D grants typically range between $20,000 and $500,000 annually for a given airport. The match rate is 90 percent state and 10 percent local. Eligible project categories include enhancing safety, capacity, security, and preparing ALUCPs (Caltrans, 2019b). Since Fiscal Year 2017-2018, A&D grants have not been programmed as there were no remaining funds from Annual Credits and AIP Matching Grants due to overall decline in tax revenues associated with fuel sales.

7.2.4 CARB'S Clean Transportation Incentive

CARB highlights aviation in its Long-Term Heavy-Duty Investment strategy and Clean Transportation Incentives come from the Low Carbon Transportation Investments and Air Quality Improvement Program. These funds are appropriated to CARB through the California State Budget. Each fiscal year, CARB must submit a Proposed Funding Plan to the CARB Board for consideration for potential approval.

The Funding Plan establishes CARB's priorities for the funding cycle, describes the projects and programs CARB intends to fund, and sets funding targets for each project or program. It also includes staff proposed policy changes for the incentive projects and programs. The Funding Plan is paired with regulatory guidelines to direct CARB's implementation of the projects and programs.

7.2.5 State Loan Program

Caltrans administers a discretionary revolving loan program that includes three types of loans: Revenue Generating Loans, Airport Development Loans, and

Matching Funds Loans. These typically low-interest loans are repayable over a period not to exceed 17 years.

Loans from this program are discretionary and are available for airport development and land acquisition, to provide funds to match AIP grants, or to develop revenue producing facilities (e.g., aircraft storage hangars, terminals, fueling facilities, utilities, etc.) at any publicly owned, public-use airport so long as the funds are used for general aviation purposes. The interest rate for these loans is based on the most recent issue of State of California bonds sold prior to approval of the loan.

7.3 Local Sources

The three primary local sources are available for airport capital development funding: Passenger Facility Charges (PFCs), tax-exempt bonds, and internally generated capital from retained airport revenues.

7.3.1 Passenger Facility Charges (PFCs)

A commercial service airport may collect a fee, known as a PFC, from each enplaned passenger to aid in the implementation of its capital improvement program (CIP). To be eligible for PFC funding, a project must:

- preserve or enhance safety, security, or capacity of the national air transportation system;
- reduce or mitigate airport noise from an airport; or
- provide opportunities for enhanced competition between or among air carriers.

This funding mechanism helps an airport raise local funds for improvement projects that can be used in conjunction with other federal and state resources.

7.3.2 Tax-Exempt Bonds

Primary airports have long used bonds to finance large-scale capital projects with long-term debt. Bonds are often used to construct and renovate parking garages, terminal buildings, maintenance facilities, and other airport services. Tax-exempt Private Activity Bonds are the most widely used type of bond issued to finance airport capital projects.

7.3.3 Internally Generated Capital from Retained Airport Revenues

Airport sponsors and operators depend on various sources of aeronautical and non-aeronautical revenue to fund capital projects. For example, most commercial service and general aviation airports charge user fees associated with aircraft parking and storage, aviation-related ground and building rent, landing, and fuel flowage. After covering operating expenses, any leftover revenue is often used to pay for capital projects.

7.3.4 Non-Aeronautical Real Estate Development through Public Private Partnerships

Airports fortunate enough to have available and developable real estate may enhance their revenues through non-aeronautical real estate development including logistics facilities, cargo facilities, distribution centers, and warehouses; foreign trade zones; and aviation-compatible commercial development. The FAA must approve these uses as they are usually deemed non-aeronautical and may require land-release approval to facilitate their development. Specific uses applicable to AAM include the development of energy generation facilities such as microgrids.

7.4 Funding Challenges

Airports are economic engines for regional, state, and national economies. They promote economic activity locally, provide jobs, and can help attract businesses that rely on air transportation to facilitate the movement of people and goods. Unfortunately, revenues to support California's airports, especially its general aviation airports, are insufficient to match the needs identified in the State's Aeronautical Capital Improvement Program, which is largely unconstrained and identifies capital projects for a 10-year period. Currently, no relationship exists to link aviation needs to available funding. No additional revenue sources have been identified to compensate for the decreased revenues provided by excise tax charged on aviation fuels.

8.0 EQUITY CONSIDERATIONS

AAM has the potential to introduce aviation operations to new, non-airport locations and pose new challenges to transportation and social equity. Such challenges may include:

- Disproportionate environmental effects to environmental justice/equity challenged communities, such as displacement.
- Equity of access to AAM infrastructure, so that it is available, and beneficial to all Californians.
- Monopolization of AAM infrastructure ownership and operations.

8.1 Transportation and Social Equity

Equity in transportation means ensuring that all community members have their needs met by the transportation systems available to them. Caltrans has identified equity as central to transportation system planning. As AAM is integrated into California's multimodal transportation system, it will be important to understand, evaluate, and implement proposed infrastructure and operations in a manner that reflects state equity considerations.

This section identifies processes that assists the State of California in coordinating, collaborating, and implementing actions to achieve outcomes beneficial to its residents, and specifically its equity-challenged communities.

Equity and AAM

The term "equity" applies to AAM in two ways:

- ***Access Equity:*** *Can refer to providing open access to airspace, infrastructure, and operations.*
- ***Transportation Equity:*** *Can refer to the ability of transportation systems generally, and AAM specifically, to provide fairness to users in terms of mobility and the socioeconomic benefits that come with increased mobility.*

This section focuses primarily on equity with regard to transportation equity.

8.1.1 Potential Equity Challenges for AAM

AAM has the potential to raise several equity-based concerns associated with vertiport /infrastructure development and AAM operations such as:

- Issues of affordability and accessibility to AAM services.
- Potential environmental and socioeconomic effects on nearby communities.
- Broader environmental justice considerations (Cohen et al., 2024; Popper et al., 2024).

Affordability and Accessibility

Affordability is likely to be a primary challenge to equity-challenged communities; current on-demand services, such as helicopter-based passenger and medical transport services, are premium offerings with high costs. The projected reductions in operational costs resulting from electrification and automation may not be sufficient to make AAM price points accessible to lower- and middle-income households in the near term. Comparisons to the early democratization of commercial aviation indicate that affordability may take decades to achieve. Emergency response applications, such as aeromedical transport, could also exacerbate inequities, as individuals without adequate insurance coverage may face barriers to access or high medical transportation bills.

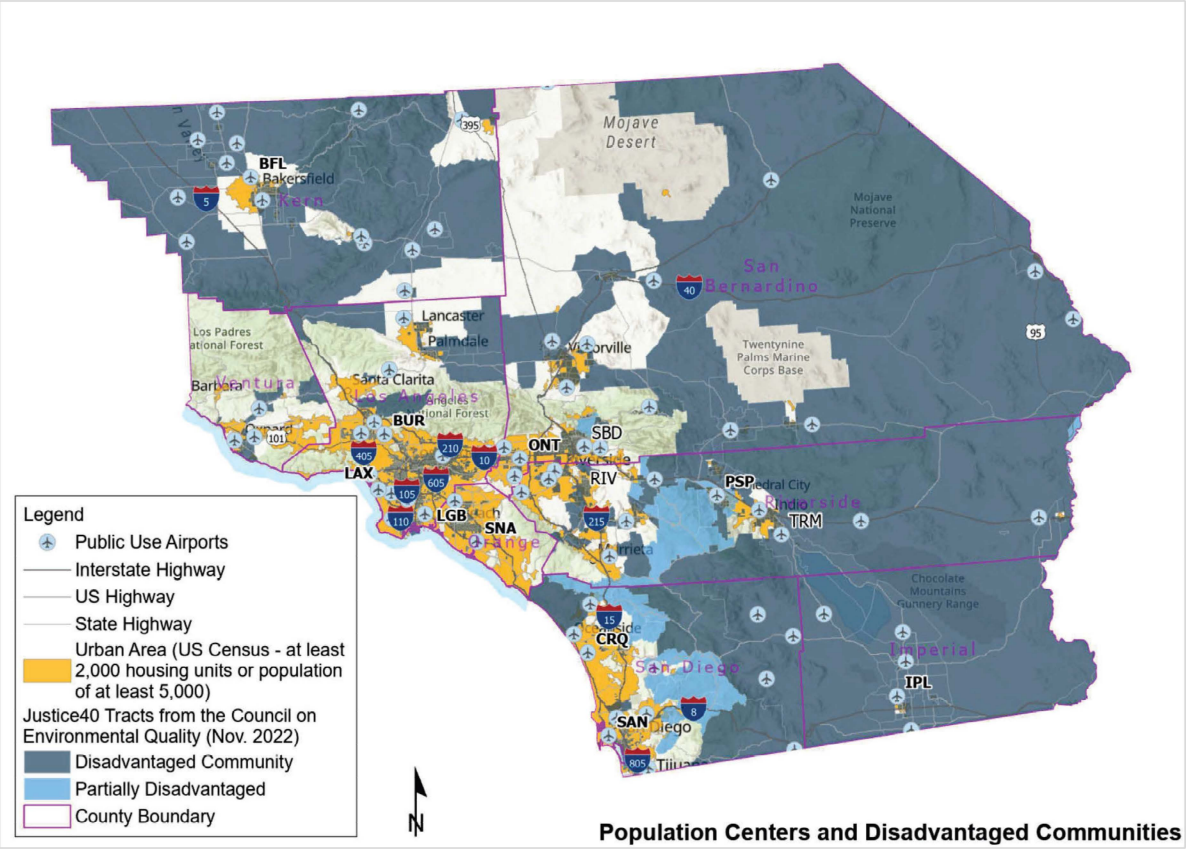
Similarly, it is unclear to what degree broad accessibility for people with disabilities will be achieved. Accessibility does not only include direct access to the infrastructure and aircraft, but also connectivity between modes, ensuring that the traveler is able to make the complete trip from origin to destination.

Infrastructure Siting and Operations

Decisions associated with infrastructure siting and the location of AAM operations have the potential to cause disproportionately greater environmental effects to low-income, minority, and other vulnerable populations (Cohen, Shaheen, & Wulff, Planning for Advanced Air Mobility, 2024). Potential effects include noise, aesthetic, and overflight associated with flight paths/AAM operations and potential gentrification and displacement resulting from infrastructure siting.

Some AAM proponents have suggested that AAM operations would benefit from the use of highway corridors as such corridors support visual navigation and do not cause aircraft to fly directly above communities, thereby reducing potential noise effects. However, available geographic information system data indicate that environmental justice communities are frequently located adjacent to highway corridors and, therefore, subject to disproportionately greater environmental effects associated with vehicle noise, air quality emissions, and potential community fragmentation as a result of highway infrastructure. As shown in an example of Southern California in **Figure 10** on page 77, disadvantaged communities or partially disadvantaged communities are frequently located adjacent to state highway segments.

Figure 10: Disadvantaged and Partially Disadvantaged Communities adjacent to Southern California Highways



Source: Mead & Hunt, 2024; ESRI.

8.1.2 Addressing Potential Equity Challenges

Public agencies at all levels of government can play a critical role in evaluating, preventing, and mitigating potential disproportionate impacts during the environmental review processes associated with discretionary actions. The environmental analyses may be conducted by government agencies or project sponsors, but governments must determine the adequacy of such reviews prior to discretionary approvals or permitting review processes. For AAM, these processes will vary based on the location of proposed infrastructure and flight corridors.

- **Airport Infrastructure Proposals:** As previously discussed, AAM infrastructure and operations proposed at federally obligated airports will be subject to the NEPA and FAA approvals. The NEPA analysis must address potentially disproportionate environmental effects to low-income and minority populations. If state or local funds are used or discretionary approvals are needed, a proposed project will be required to comply with CEQA as well.
- **Non-Airport Proposals:** AAM infrastructure proposals by private and public sponsors will likely require discretionary approvals from the government agencies with jurisdiction where the infrastructure and operations are proposed, such as a city or county. In such cases, a state or local government agency with jurisdiction will be responsible for reviewing and adopting/certifying a CEQA document, which includes a discussion of socioeconomic impact and land use effects of a proposed project. The approved environmental documentation must be submitted to Caltrans as part of a subsequent application for siting approval and permit issues.

8.1.3 Available Tools

Local agencies will be required to undertake environmental analyses associated with proposed AAM infrastructure and operations and demonstrate to Caltrans during the facility siting and permit issuance process that appropriate environmental analyses have been completed prior to the submission of an application for Site Approval or Permit Issuance. To address issues associated with equity, Caltrans and other state agencies have developed tools to assist project sponsors in considering equity prior to decision-making.

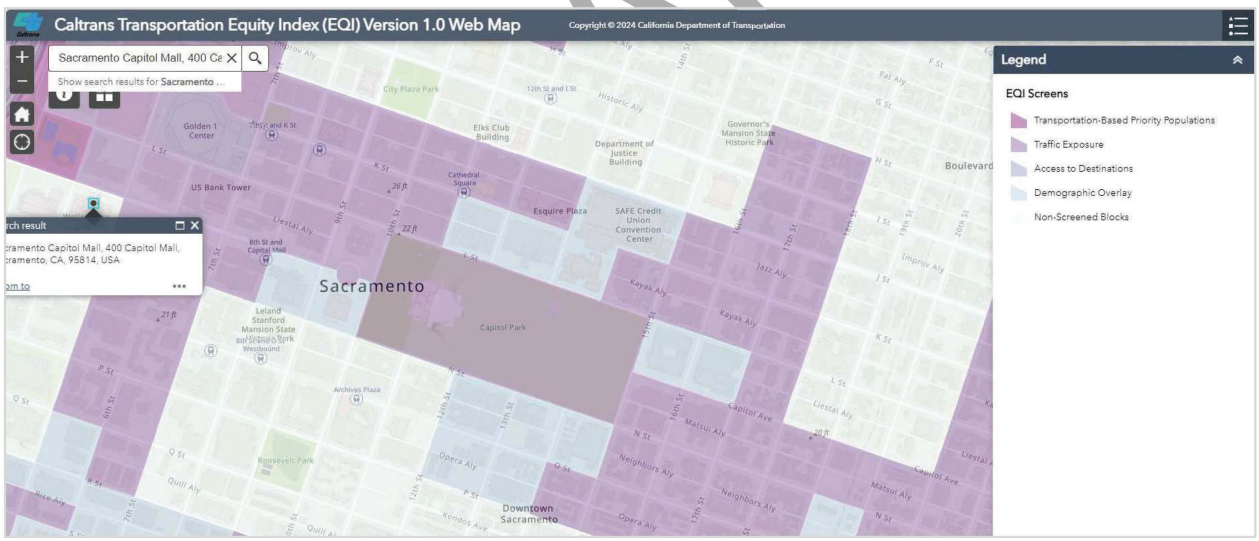
Transportation Equity Index

Caltrans developed the Transportation Equity Index (EQI) as a spatial screening tool to identify the presence of transportation-based priority populations. The tool identifies three groups:

- **Transportation-Based Priority Populations:** Communities that are most burdened by the transportation system and receive the fewest benefits.
- **Traffic Exposure:** Communities that are the most burdened through high exposure to traffic and crashes.
- **Access to Destinations:** Communities that have the greatest gaps in multimodal access to destinations.

Figure 11 below is a picture of the EQI Web Map for the neighborhood surrounding the State Capitol. As shown, the area includes transportation-based equity populations challenged by traffic exposure and access to destinations. The EQI tool is available at: https://dot.ca.gov/programs/esta/race-equity/eqi

Figure 11: EQI Web Map focused on the California State Capitol.

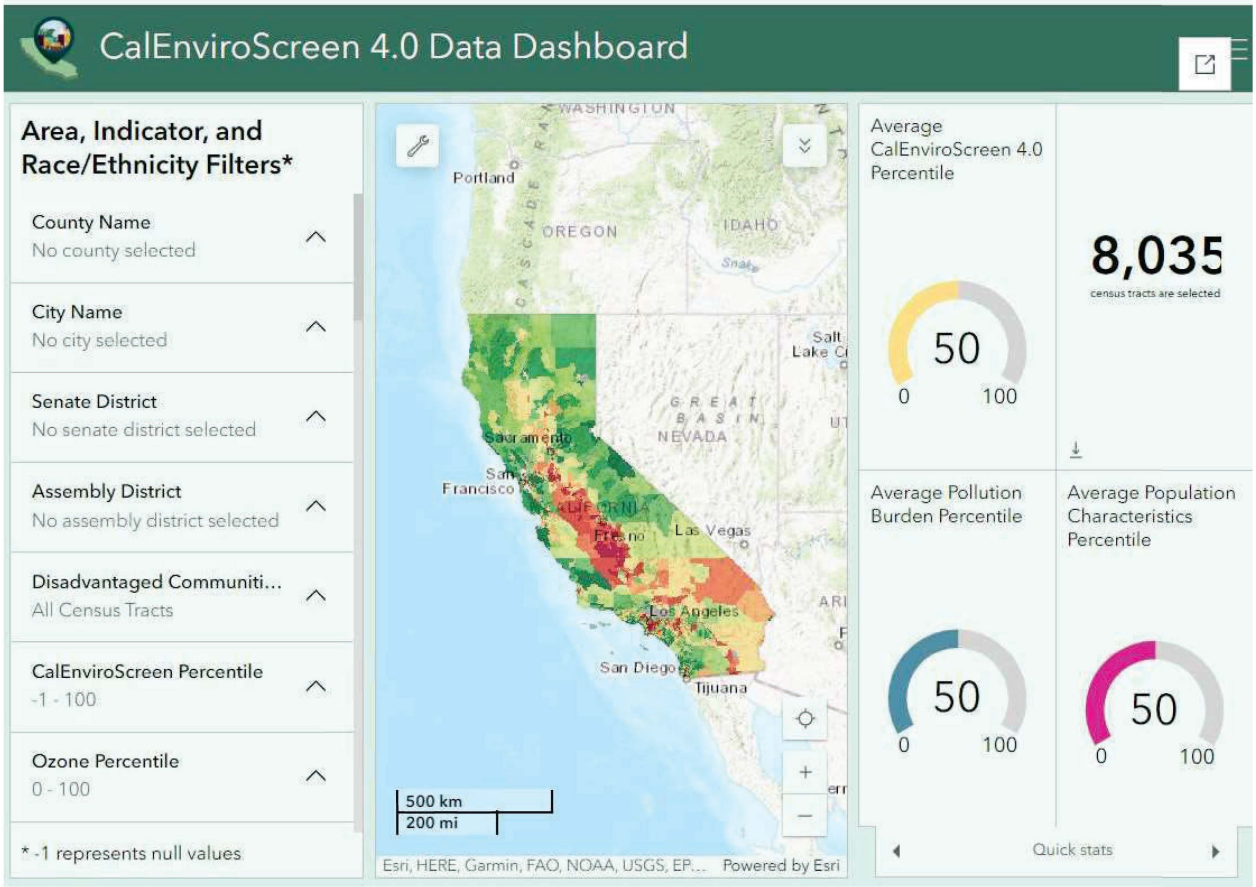


CalEnviroScreen

The Office of Environmental Health Hazard Assessment, which is part of CalEPA, developed the CalEnviroScreen tool to help identify communities that are disproportionately burdened by multiple sources of pollution. The tool enables users to select areas of interest based on various geographies, CalEnviroScreen

scores, percentile ranges, or thresholds for any combination of the 21 CalEnviroScreen indicators. Users can also select areas by ethnic or racial makeup. **Figure 12** below is a snapshot of the CalEnviroScreen Data dashboard. The tool is available at: https://oehha.ca.gov/calenviroscreen/report/calenviroscreen-40.

Figure 12: CalEnviroScreen Dashboard



8.1.4 AAM-specific Equity Assessment Considerations

An equity assessment and analysis could be incorporated into various segments of the project planning process including project scoping, stakeholder engagement, the assessment of impact analysis, and the development of mitigation measures. Exploring alternatives associated with proposed vertiport locations helps to secure broader public support for proposed projects (Yedavalli & Cohen, 2022). Finally, a focus on transparency throughout the

process can help build trust with the public, local communities, and stakeholders.

AAM offers new technology and aviation operations in new locations, and public outreach and education will be critically important. An equity assessment should provide opportunities for clear communication, stakeholder education, and collaboration among stakeholders to help address conflicts and ensure that diverse interests are considered. The Association for Public Participation, Spectrum of Public Participation, provides a model for stakeholder outreach (see **Figure 13** on page 82). Balancing equity goals with economic considerations through careful planning and phased implementation can help ensure the potential viability of projects without compromising a commitment to serving the public good.

Figure 13: Stakeholder Engagement Spectrum

Source: Mead & Hunt, Inc., & International Association for Public Participation, Spectrum of Public Participation

While the integration of AAM presents several opportunities for the State of California and its residents, its success depends on ensuring equitable access and benefits across the transportation system. Local agencies should consider adopting an equity-focused approach that emphasizes inclusive planning, addresses disparities, and prioritizes the needs of underserved populations.

Key aspects of an equity-focused approach could include:

- **Data-driven analysis:** Using available tools, such as Caltrans EQI and CalEnviroScreen, to assist with analyses.
- **Community engagement:** Establishing robust community outreach programs to actively engage diverse stakeholders, including low-income communities, people with disabilities, and residents of rural areas, to gather feedback and ensure their needs are considered throughout the AAM development process.
- **Accessibility considerations:** Ensuring that AAM infrastructure and routes are compliant with the Americans with Disabilities Act and evaluating the proximity of proposed infrastructure to essential services and public transit connections to minimize barriers to access.
- **Affordability measures:** Exploring strategies to make AAM services affordable for all income levels, such as tiered pricing structures, essential air service programs, subsidies for low-income users, and potential partnerships with community-based organizations.
- **Equity metrics:** Establishing clear, measurable metrics to track progress towards achieving transportation equity, including indicators related to access, affordability, and use by diverse communities.
- **Targeted outreach and education:** Conducting focused outreach campaigns to inform underserved communities about AAM opportunities, address concerns, and encourage participation in decision-making processes.
- **Knowledge building:** Providing training and support to community organizations to equip them with the knowledge and skills necessary to effectively engage in AAM planning and implementation.

8.1.5 Opportunities for Equity-focused Analyses

Equity analyses associated with proposed AAM projects should focus keenly on issues related to transportation equity and environmental effects, such as potential displacement, safety, and overflight. Project proponents, agencies reviewing proposed environmental analyses, and other stakeholders should be made aware of available tools such as Caltrans EQI and CalEnviroScreen.

Linking Equity and the State Economy:
California "GO BIZ" Grant Awarded to Joby Aviation

Joby Aviation, an OEM located at the Marina Municipal Airport, and the Governor's Office of Business and Economic Development (GO-Biz) entered into a California Competes (CalCompetes) Grant Agreement on October 30, 2023, that provided Joby with a $9.8 million grant to keep its equipment manufacturing and associated research and development facilities in California. Without the Go-Biz agreement and award, the leading OEM would locate its facilities in another state. (Go-Biz, 2023).

Photo: Joby Aviation

The proposed project provides important equity benefits as Joby expands its facilities in Marina and Santa Cruz, CA. As part of the agreement, Joby agreed to:

- *create at least 500 full-time based jobs;*
- *provide $10 million facility construction or renovation during the agreement's five-year term; and*
- *locate the project in an area of high unemployment and/or poverty or unemployment.*

As part of the agreement, Joby estimated that it would exceed the grant agreement by providing 690 new full-time jobs and $41.3 million in investments through Fiscal Year 2027.

The grant supports both Joby and the State of California. The Go-Biz agreement supports Joby's efforts to accelerate early manufacturing, support Joby's ongoing efforts for aircraft type certification from the FAA and support initial commercial operations. The grant provides benefits to an equity challenged community while affirming California's commitment to AAM through a partnership with government, community, and industry. ***California Senator Anna Caballero commented that Joby's efforts at the Marina Municipal Airport "can be a model for how we solve climate, housing, and transportation challenges."***

8.2 Equitable Access to AAM Infrastructure Ownership and Operations

SB 800 specifically requires Caltrans to identify a pathway to prohibit the monopolization of AAM Infrastructure, ownership, and operations. The FAA and the State Aeronautics Act provide guiderails to avoid monopolization through their regulations, funding requirements, and policies.

8.2.1 Federal Regulations Grant Assurances

When airport owners or sponsors, planning agencies, or other organizations accept funds from FAA-administered airport financial assistance programs, they must agree to certain obligations (or assurances). The grant assurances require fund recipients to maintain and operate their facilities safely and efficiently and in accordance with the conditions specified in the grant assurances. In the grant assurances, the term "public agency sponsor" means a public agency with control of a public-use airport; the term "private sponsor" means a private owner of a public-use airport; and the term "sponsor" includes both public agency sponsors and private sponsors.

The FAA has identified 39 grant assurances that address the use of airport infrastructure: nos. 22, 23, and 39.

Grant Assurance 22, Economic Nondiscrimination

Grant Assurance 22 requires an airport sponsor to "make the airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the airport." Pursuant to this grant assurance, the sponsor of a federally obligated public-use airport, regardless of whether that sponsor is associated with a public agency or a private entity, must make an airport available for aeronautical activities, including those associated with AAM infrastructure and forthcoming operations. Key elements of the grant assurance include the following:

- The airport must be made available for public use, including commercial aeronautical activities.
- When entering in an agreement with potential fixed-based operators (FBOs) or other tenants, the sponsor will require an FBO or tenant to furnish services

on a reasonable and not unjustly discriminatory basis to all users and charge reasonable prices.

- Each air carrier shall have the right to use any FBO that is authorized or permitted by the airport to serve any air carrier.
- The sponsor may prohibit or limit any given type, kind, or class of aeronautical use of the airport if such action is necessary for the safe operation of the airport or necessary to serve the civil aviation needs of the public.

Within the context of Grant Assurance 22, AAM operations and the use of AAM-related infrastructure would be considered aeronautical activities, and an AAM operator would be considered an air carrier and operate Under Title 14 of the Code of Federal Regulations (CFR) Part 135, *Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft* (Part 135). Those responsible for vertiports or another AAM-related infrastructure, whether it the airport sponsor or a tenant, such as an FBO, would be required to service all users and charge reasonable fees regardless of the use. Grant Assurance 22 would prevent one FBO or vertiport operator from treating users differently or giving preferential treatment to a specific user.

Grant Assurance 23, Exclusive Rights

Grant Assurance 23 prohibits an airport sponsor for granting exclusive rights to "any person providing, or intending to provide, aeronautical services to the public". Some exceptions can be made in the case of FBOs if the following two conditions are met:

1. It would be unreasonably costly, burdensome, or impractical for more than one fixed-based operator to provide such services.
2. If allowing more than one fixed-based operator to provide such services would require the reduction of space leased pursuant to an existing agreement between such single fixed-base operator and such airport. It further agrees that it will not, either directly or indirectly, grant or permit any person, firm, or corporation, the exclusive right at the airport to conduct any aeronautical activities, including, but not limited to charter flights, pilot training, aircraft rental and sightseeing, aerial photography, crop dusting, aerial advertising and surveying, air carrier operations,

> aircraft sales and services, sale of aviation petroleum products whether or not conducted in conjunction with other aeronautical activity, repair and maintenance of aircraft, sale of aircraft parts, and any other activities which because of their direct relationship to the operation of aircraft can be regarded as an aeronautical activity, and that it will terminate any exclusive right to conduct an aeronautical activity now existing at such an airport before the grant of any assistance under Title 49, United States Code.

As described in the grant assurance, an airport sponsor cannot grant any entity the exclusive right to conduct activities associated with AAM including charter flights, air carrier operations repair and maintenance of aircraft, or vehicle charging.

Grant Assurance 39, Competitive Access

Grant Assurance 39, Competitive Access refers specifically to owners or operators of medium- or large-hub airports. If a Sponsor is "unable to accommodate requests by an air carrier for access to gates or other facilities at the airport in order to allow the air carrier to provide service to the airport or expand service at the airport," Grant Assurance 39 requires the operator to transmit a report to the Secretary of Transportation to explain why the request could not be accommodated.

Grant Assurance 39 indicates that airport sponsors will be required to honor requests from OEMs or AAM operators to use airport facilities unless there is a specific reason. The reason must be submitted to the FAA as well as an estimated time when the request can be honored. State Aeronautics Act

FAA grant assurances apply to airport operators that receive federal funding. As noted earlier, 191 of California's 241 public use airports are eligible to receive federal funds, which would require them to act in accordance with FAA grant assurances to prevent the exclusive use of a vertiport. Airports that have not received federal funds would not be subject to FAA grant assurances but would be required to comply with the State Aeronautics Act, Article 4.5, *Airport Facilities and Concessions*, and applicable local codes associated with the use of facilities that are constructed or operated using public funds.

Article 4.5 of the State Aeronautics Act (Sections 21690.5 -21690.10) recognizes the role of publicly owned or operated airports as "essential to the welfare of the state and its people" and that "the economic validity and stability of California's publicly owned or operated airports is, consequently, a matter of statewide importance." However, the State of California neither owns nor operates any airport, and Article 4.5 applies to airports owned or operated by a political subdivision.

State law is less stringent than federal regulations associated with exclusive agreements. The law assumes that it may be necessary for publicly owned or operated airports to enter into exclusive or limited agreements when the governing body determines that such an agreement is needed to further the goals of Article 4.5—presumably, their essential role in supporting "the welfare of the state and its people." However, a governing body must consider seven factors to determine the need for an exclusive agreement to fulfill the state's policies and objectives:

- Public safety.
- Public convenience.
- Quality of service.
- The need to conserve airport space.
- The need to avoid duplication of services.
- The impact on the environment or facilities of the airport as an essential commercial and tourist service center.
- The need to avoid destructive competition which may impair the quality of airport services to the public, lead to uncertainty, disruption, or instability in the rendering of such services, or detract from the state's attractiveness as a center of tourism and commerce.

State law also states that governing bodies are not excused from compliance with applicable state or local requirements for competitive bidding or public hearings, which may be required prior to entering into an agreement or lease.

8.2.2 Private Use Airports, Vertiports

As described previously, California's aviation system includes private-use airports that may be associated with a residence or business enterprise (e.g., agricultural enterprise, wineries, hotel), and the use of those facilities require permission from the owner or operator. California also has eight private use heliports. The State of California has no voice in the operation of such facilities; however, their primary use and location makes these facilities unlikely candidates for facilities that would benefit the public at large.

8.3 Managing Competition

Vertiports may operate on or off traditional airports, but competition of AAM service providers for vertiport takeoff and landing areas, parking areas, and support facilities may mirror competition among airlines for gates, aircraft parking, and baggage claim facilities. When demand for a facility by multiple service providers exceeds available capacity, a vertiport owner/operator may need to manage competition among service providers using models that are similar to those used by commercial and general aviation airports.
Federally obligated airports will be required to provide access to multiple users to the extent that they have available space; however, some flexibility may be provided using the access scenarios in **Table 11** below, which are used by commercial services airports.

Table 11: Potential Scenarios for AAM Facility Use

Scenario	Description
Exclusive access	An AAM service provider has the right to exclusive use of a takeoff/landing area or parking area through a lease by the airport owner/operator. However, additional facilities must be available for service providers.
Preferential access	An AAM service provider has first choice over takeoff and landing slots, gates, parking locations, and other facilities at a vertiport. The preferred facilities must be made available to others when they are not in use.
Prioritized Access	An airport operator/sponsor may grant access priority for a specific AAM use case, such as medical transport, law enforcement, firefighting, or emergency management.

Scenario	Description
Public/Open Access	All service providers have access to vertiport facilities.

Source: Adapted from Cohen et al., 2024.

8.4 Conclusions and Recommendations

While California does not prohibit exclusive use agreements, federal regulations, state law, and local requirements provide guardrails to prevent the potential monopolization of AAM facilities in terms of facilities or use cases:

- A total of 191 of California's 241 public-use airports are federally obligated airports and, therefore, subject to FAA grant assurances.
- Specific criteria must be met for a local governing body/airport sponsor to enter into an exclusive lease or use arrangement.
- Most local jurisdictions require competitive bidding prior to entering into a lease agreement for a defined period.
- Existing business models used at airports to manage the use of limited facilities are available for adaptation to vertiports and AAM service providers.

Perhaps one of the greatest deterrents to the monopolization of AAM operations, however, is its reliance on other transportation facilities. To be successful, AAM operators must provide opportunities to other modes of transportation that enable first-/last-mile access to desired destinations. Although the role of federal, state, and local agencies may be limited in terms of privately owned and operated vertiports, the reliance of AAM on other subsidized forms of transportation will provide guardrails in preventing disproportionate impacts to nearby equity challenged populations and environmental justice communities:

- Proposed Vertiports that include the use of federal, state, or local funds or include connections to public-use airports, passenger rail, light rail, and publicly funded local transportation facilities will require environmental and other approvals by federal and/or local agencies and, therefore, be subject to environmental analysis pursuant to NEPA and/or CEQA. Socioeconomic analyses are inherent in both NEPA and CEQA evaluations, though both

frameworks may require additional context to address potential AAM-related effects.

- Privately funded and operated facilities that are not connected to local facilities may require zoning changes or require an extension of public facilities, such as roads. Such projects would be subject to CEQA to obtain discretionary approvals at the local level.
- In addition to regulatory remedies, local agencies can encourage public, private, and public-private partnerships to prevent the monopolization of AAM ownership and operations.

In rare instances, standalone vertiports may be proposed on private lands and require only ministerial approvals from local jurisdictions followed by siting approval and permit issuance from Caltrans.

9.0 THREE-YEAR IMPLEMENTATION WORK PLAN

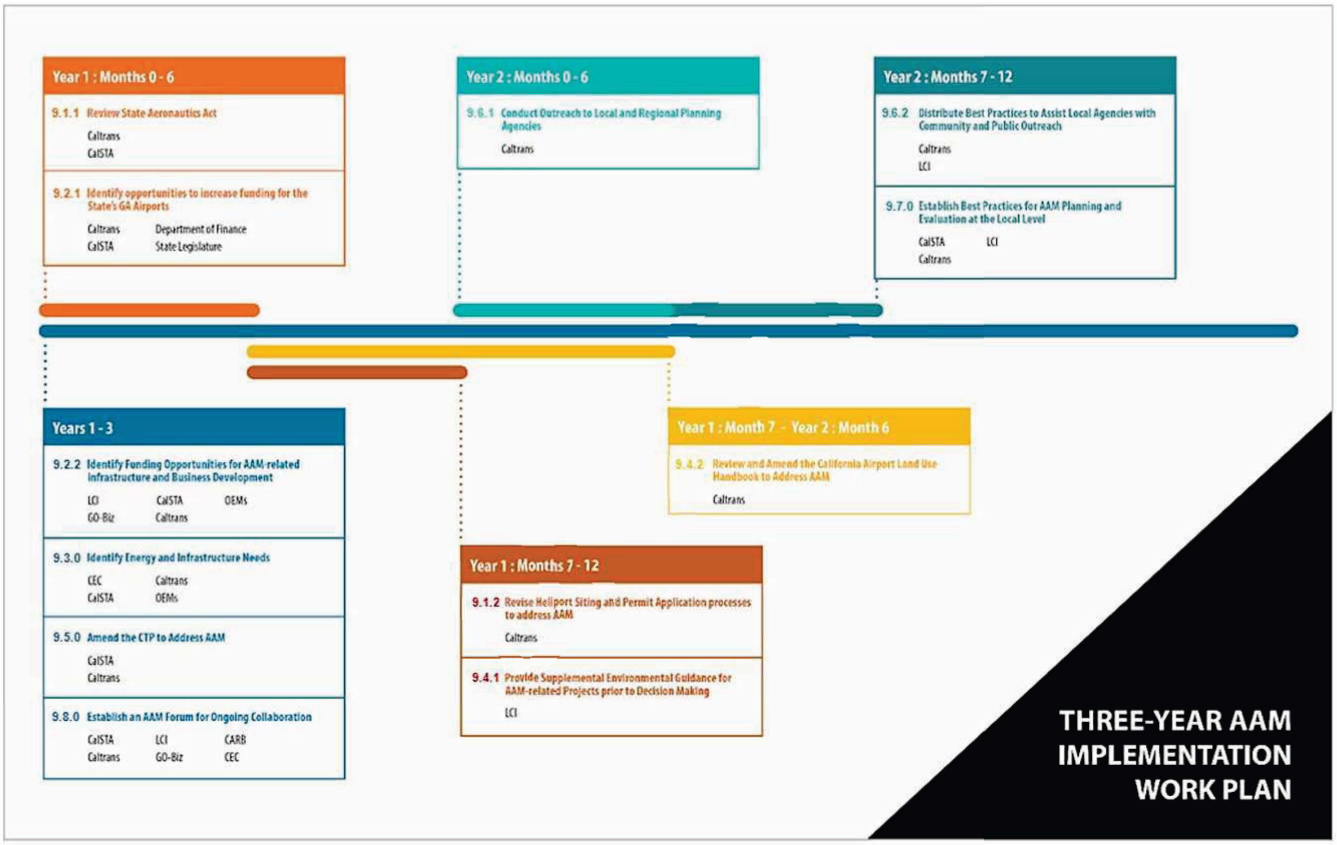
California has been a leader in addressing issues associated with global climate change and sustainability, and the Governor's Office has engaged with leaders internationally to consider the implementation of AAM as an emissions-free, comparatively quieter transportation mode that has the potential to enhance transportation access and quality-of-life for California's citizens. To support the envisioned initiation of AAM in California, this section considers the identified opportunities and constraints for AAM development in California as well as specific measures that can be undertaken to supplement efforts from the FAA, NASA, OEMs, and other stakeholders. The proposed work plan identifies key items that may require changes to laws, regulations, or procedures to facilitate AAM operations; these key items are associated with the following topic areas:

- The State Aviation Act and Implementing Procedures
- Funding
- Energy and Infrastructure
- Environmental Considerations
- Land Use Compatibility Planning
- Statewide Transportation Planning
- Agency and Stakeholder Outreach
- Ongoing Collaboration

The proposed measures associated with each topic area are described in Sections 8.1 through 8.6, including the sequencing of measures during a three-year timeframe.

Figure 14 on page 93 shows the timeline associated with the three-year implementation work plan and its associated tasks.

Figure 14: Three-Year AAM Implementation Work Plan Timeframe



Source: Mead & Hunt, Inc.

9.1 State Aeronautics Act and Implementing Procedures

9.1.1 Review Aeronautics Act

Task
Review State Aeronautics Act Review and recommend revisions/amendments to the SAA to address AAM.
Responsibility
Caltrans CalSTA
Timeframe
Year 1: Months 0 to 6

The State Aviation Act (SAA) (PUC Section 21001 *et seq.*) seeks to further and protect the public interest in aeronautics through various means including, but not limited to, "Effecting uniformity of the laws and regulations relating to aeronautics consistent with federal aeronautics laws and regulations".

As discussed in Section 6.1, the Federal government has enacted several pieces of legislation associated with the envisioned AAM operations, and the 2024 FAA Reauthorization Act underscores the commitment of lawmakers to make the U.S. a global leader in AAM. Based on the emphasis placed on AAM in the FAA Reauthorization Act of 2024, Caltrans should review the SAA and identify whether it requires revision or amendment to coincide with recent legislation associated with AAM.

Specific items to be reviewed for possible modification include, but are not limited to:

- **Chapter 1 - General Provisions and Definitions:** AAM, Regional Air Mobility, Urban Air Mobility, vertiport, power-lift aircraft. Additional definitions may include CTOL, STOL, and VTOL, and eVTOL.
- **Article 3 - Regulation of Airports:** Consider vertiports in the following sections:
  - Sec. 21662 Approval of Sites; Issuance of Permits
  - Sec. 21662.5 Helicopters in Proximity to Certain Schools Prohibited
  - Sec. 21663 Operation Without Permit
  - Sec. 21664 Approval of Sites; Application
  - Sec. 21664.5 Amended Airport Permits; Airport Expansion Defined
  - Sec. 21666 Issuance of Permits; Requirements; Conditions
  - Sec. 21668.2 Suspension of Operation

- **Article 3.5 - Airport Land Use Commission:** Consider public vertiports.
- **Chapter 6 - Airport Planning:** Consider vertiports in the California Aviation System Plan (Section 21701et. seq).

9.1.2 Caltrans Role in Vertiport Siting and Permitting

Task
Revise Heliport Siting and Permit Application processes to address AAM
Responsibility
Caltrans
Timeframe
Year 1: Months 7 through 12

The SAA grants Caltrans the authority to issue airport site approval permits, amended airport site approval permits, airport permits, and amended airport permits (PUC Sections 21664 to 21668.2), and it is unlawful for a local agency to operate an airport unless an appropriate airport (or heliport) permit has been issued by Caltrans and has not subsequently been revoked. The only exception applies to public safety agencies authorized to arrange for emergency medical services, which may designate an area for the takeoff and landing of an emergency service helicopter in accordance with established regulations.

It is anticipated that Caltrans will be responsible for vertiport siting and permitting in the same way that it is responsible for reviewing and approving proposed airport/heliport sites and issuing airport/heliport permits. It is also anticipated that vertiport site review and permit processes will be parallel to those currently in place for airports and heliports in accordance with the SAA, state guidance, and applicable federal regulations and guidance. Regardless of the decision to revise the language in the SAA to specifically identify vertiports, Caltrans will need to alter its review process and associated applications to include the review of vertiports, including vertistops and vertihubs, and to address AAM-specific considerations.

Table 12 summarizes Caltrans' current helicopter permitting procedures and identifies specific items that Caltrans should consider when identifying a new process for permitting vertiports that will not be sited on commercial service airports. Permit applications and instructions will need to be revised to reflect AAM considerations and potentially revised language in the SAA.

Table 12: Existing / Proposed Siting and Permit Issuance Processes for California Heliports and Vertiports

Current Requirements	Vertiport Considerations and Process Implications
Heliport Siting Approval (Required to obtain an operation permit)	
Submit Caltrans Form DOA-0201, Heliport Site Approval Application including the following data: • **Facility Data:** Heliport drawings in accordance with FAA design standards, Part 77 surfaces, makings, and topographic maps showing approach/departure surfaces relative to the proposed facility. • **Facility Location Data:** Maps showing the locations of schools, places of public gathering, and residential areas within 1,000 feet of the center off the proposed final approach and takeoff area. • **Ownership Data:** Document proof of ownership to possess the facility (as owner or through a minimum one-year lease). • **Proof of Compliance with Local Processes:** Proof of action by Airport Land Use Commission (ALUC) and CEQA review/certification. • **FAA Airspace Determination:** FAA determination following Form 7480-Notice of Landing Area Proposal.	A parallel process for Vertiport Siting might include the following in addition to current heliport requirements: **Additional Facility Data:** • Description of use case/facility purpose, and community served (commuters, freight transit, etc.). • Distance to associated facilities (nearest transit station, job center, tourist site). • Identification of/compliance with appropriate regulations and guidance associated with vertiports, such as EB 105, Vertiport Design and any additional local agency approvals. • For multimodal facilities, identification of/compliance with applicable regulations and guidance for facility type (i.e., setbacks required for rail, transit, or airport facilities set forth by transportation agencies).

Current Requirements	Vertiport Considerations and Process Implications
Permit Issuance	
Caltrans will review the Heliport Site Approval Application to identify: • **Minimum Heliport Standards:** Site meets or exceeds minimum standards specified by the Caltrans in its rules. • **Safe air traffic patterns:** Safe air traffic patterns have been established for the proposed heliport and all existing/approved heliport/airport sites in the vicinity. • **Safe Zones of Approach:** Safe "zones of approach" are set up in compliance with CFR Part 77. • **Public advantage.** Public advantage outweighs potential environmental disadvantages (e.g., noise, increased surface traffic).	A parallel process for Vertiport Permit Issuance might include the following in addition to current heliport requirements: **Safe Air traffic Patterns:** • Safe evaluation of safe air traffic patterns established for all existing/heliports, airports, *and vertiport* sites in the vicinity. **Proof of compliance with additional FAA requirements:** • As required, proof of compliance with FAA regulations associated with aircraft operations and facility requirements associated with Title 40 of the Code of Federal Regulations (CFR) Part 91, 135, or 121 in association with passenger transport.

Current Requirements	Vertiport Considerations and Process Implications
Amended Permits	
Submit Caltrans form DOA-0202 and provide the same information/documentation required for initial Heliport Siting Permitting.	*See vertiport considerations identified above in reference to Heliport Siting Approval.* **Additional Facility Data:** • Description of use case/facility purpose, and community served (commuters, freight transit, etc.). • Distance to associated facilities (nearest transit station, job center, tourist site). • Identification of/compliance with appropriate regulations and guidance associated with vertiports, such as EB 105, Vertiport Design and any additional local agency approvals. • For multimodal facilities, identification of/compliance with applicable regulations and guidance for facility type (i.e., setbacks required for rail, transit, or airport facilities set forth by transportation agencies).

Source: Mead & Hunt, Inc.

9.2 Identify Opportunities to Secure Funding for Airports and AAM Deployment

9.2.1 Identify Opportunities to Increase Funding for the State's General Aviation Airports

Task
Identify opportunities to increase funding for the State's GA Airports
Responsibility
Caltrans
CalSTA
Department of Finance
State Legislature
Timeframe
Year 1: Months 0 to 6

California's general aviation airports are critical transportation resources, not only for business and personal travel, but also to support response to disasters and emergencies such as wildfires, among other uses. While these airports are important assets that can contribute to a robust AAM network, most will require investments to achieve AAM readiness.

As described in the 2020 California Aviation System Plan, both the federal government and state government provide funding to California's general aviation airports. The FAA Airport Improvement Program (AIP) provides general aviation airports with an entitlement of $150,000 annually per airport and discretionary grants that are awarded competitively and require local matching funds. Caltrans provides grants and loans to fund airport projects through the California Aid to Airports Program (CAAP), which provides a $10,000 state annual credit to each general aviation airport for airfield maintenance and a match up to 5 percent to supplement FAA AIP grants.

State excise tax on jet fuel and aviation gasoline is Caltrans' primary source of revenue to fund and maintain the State's aviation grant programs; however, the leveling off of fuel sales, along with the lack of adjustment of excise taxes – last adjusted in 1962 for jet fuel, and 1994 for aviation gasoline – have constrained the ability of Caltrans to adequately fund maintenance and infrastructure improvements at general airports, requiring airports to rely on limited local funding sources and any revenue generating activities on their airports when possible. Moreover, the amount of money available for the State's general aviation airports does not reflect the needs identified in the department's unconstrained Capital Improvement Plan. A dependable source of income is

needed to protect the State's general aviation assets and ready them for AAM use.

9.2.2 Identify Funding Opportunities for AAM-related Infrastructure and Businesses Development

California's commitment to sustainability, zero-emission transportation and AAM is strong. Since 2021, through the Governor's Office of Land Use and Climate Change (LCI), state leaders have engaged with leaders internationally to share ideas associated with sustainable transportation and AAM. California's commitment to sustainability, equity, and job creation is also demonstrated by the Governor's Office of Business and Economic Development's recent collaboration with Joby. The public-private collaboration resulted in the award of a $9.8 million grant to Joby Aviation to support aircraft manufacturing at the Marina Municipal Airport, a general aviation airport located in an area of high unemployment.

Task
Identify Funding Opportunities for AAM-related infrastructure and Business Development Create a Forum to explore funding opportunities.
Responsibility
LCI GO-Biz OEMs CalSTA Caltrans
Timeframe
Years 1 through 3

The Governor's Office of Business and Economic Development, OEMs, and California's general aviation airports must collaborate to identify potential opportunities to support OEMs and other AAM-related businesses, support infrastructure development, and improve California's general aviation airport assets. State agencies could spearhead the development of an AAM Business Development and Airport Forum. The forum could be co-led by state economic development staff leadership.

9.3 Identify Energy and Infrastructure Needs

AAM relies on electricity, and the deployment of eVTOLs will challenge the State's supply of renewable energy and power distribution infrastructure. Coordination with the California Energy Commission, energy providers, and airport operators will be critical throughout the three-year AAM planning period.

Task
Identify Energy and Infrastructure Needs Collaborate with CEC to further the development of Clean Energy Resources to support forthcoming AAM operations.
Responsibility
CEC CalSTA Caltrans OEM
Timeframe
Years 1 through 3

The California Energy Commission (CEC) is the State's primary energy policy and planning agency. The CEC is focused on reducing GHG emissions and ensuring that Californians have a "safe, resilient, and reliable supply of energy". One of the CEC's seven core responsibilities is to help transform the State's transportation sector to zero, near-zero, and low-carbon fuels, and the CEC provides nearly $100 million annually from the Alternative and Renewable Fuel and Vehicle Technology Program to "develop and deploy low carbon fuels, infrastructure for zero and near-zero emission vehicles, and advanced vehicle technologies". Recently the program was renewed under **AB 126 (Reyes, Chapter 319, Statutes of 2023)** which modified some aspects of the program.

The Alternative and Renewable Fuel and Vehicle Technology Program seeks to direct investments to California's underserved, low-income, or disadvantaged communities that are disproportionately affected by the consequences of petroleum-powered transportation.

The CEC develops an investment plan for this program each year to establish funding priorities that align with state transportation policies and provide opportunities to complement and leverage existing public and private investments. The program's advisory committee includes representatives from private industry, government, nonprofit groups, and the public to provide valuable expertise and input in developing the investment plan.

Representatives of CalSTA, Caltrans, and OEMs committed to near-term AAM deployment in California should collaborate with the CEC to explore opportunities associated with the Alternative and Renewable Fuel and Vehicle Technology Program and AAM-related energy infrastructure development. Topics to explore include:

- Working with the CEC to align AAM infrastructure with intermodal cargo facilities that operating using zero and near-zero technologies, such as California's seaports, inland ports, and medium-and heavy-duty truck transport.
- Streamlining the installation of aircraft charging infrastructure and necessary energy grid upgrades to support near-term AAM deployment.
- Identifying funding resources to assist California's general aviation airports in pursuing electrification.

9.4 Environmental and Land Use Considerations and Guidance

9.4.1 Provide Supplemental Environmental Guidance for Reviewing AAM-related Projects Prior to Decision Making

Task
Provide Supplemental Environmental Guidance for AAM-related Projects prior to Decision Making Provide guidance for local agencies responsible for AAM-related environmental reviews
Responsibility
LCI
Timeframe
Year 1: Months 7 to 12

CEQA requires state and local agencies to inform decision makers and the public about the potential impacts of proposed projects and reduce those environmental impacts to the extent feasible. CEQA will apply to proposed vertiports that require a discretionary approval by a local governing body or require the use of state or local funds. The Lead Agency under CEQA is the agency that will approve a proposed project, such as a city, county, or special district that will approve the proposed vertiport, even if the project is proposed (sponsored) by others (i.e., project proponent).

CEQA guidance identifies twenty resource issues/areas that must be addressed in environmental documents. Key analyses that are likely associated with the construction and operation of new vertiport/vertistops include: Air quality, Land Use/Planning, Noise, Population/Housing, Socioeconomics, Transportation, and Utilities. Some analytical methods are required by CEQA while others may vary based on the proposed project.

Environmental Considerations and Processes

AAM will introduce new aircraft and new takeoff/landing facilities in locations outside of the airport, and these elements of the AAM ecosystem may require the consideration of new topics or the use of new analytical methods to evaluate potential environmental impacts effectively. Potential CEQA topics that may require new or modified analyses are summarized in **Table 13** on page 10404.

Table 13: Potentially Affected CEQA Environmental Factors and AAM-Specific Considerations

CEQA Environmental Factor	Potential AAM-Specific Considerations
Aesthetics	• Potential visual impacts from low-flying aircraft on scenic resources, historic buildings, public views, and potentially new source of light or glare associated with night flight. • Presence of aircraft in areas not previously associated with aviation.
Air Quality	• Potential positive effects and potentially fewer emissions based on reduced Vehicle Miles Traveled (VMT) by AAM users.
Cultural Resources	• Potential adverse change in the significance of historic/cultural resources associated with the effect of low-level flight over or near such resources.
Greenhouse Gas Emissions (GHGs)	• Potential positive effects associated with the use of emissions-free transportation. • Potential positive effects in furthering an applicable plan, policy, or regulation adopted for the purpose of reducing emissions of GHGs.
Hazards and Hazardous Materials	• Potential impacts associated with the routine transport, use, or disposal of hazardous materials (lithium batteries). • Potential impacts associated with the creation of a safety hazard for people residing or working within an area governed by an airport land use plan or within two miles of a public-use airport.
Land Use and Planning	• Potentially impacts associated with physically dividing a community. • Potential effects associated with conflicts with an adopted land use plan, policy, or regulation adopted for the purpose of avoiding an environmental effect (e.g., an adopted Airport Land Use Compatibility Plan; see discussion below).
Noise	• Potential impacts associated with temporary or permanent increase in ambient noise levels (see discussion below).
Population and Housing	• Potential impacts associated with induced substantial unplanned direct or indirect population growth.

CEQA Environmental Factor	Potential AAM-Specific Considerations
	• Potential impacts associated with displacing substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere (i.e., potential gentrification and displacement of persons living near proposed vertiports).
Transportation	• Potential impacts associated with conflicts with a program, plan, ordinance, or policy addressing the circulation system including transit, roadway, bicycle, and pedestrian facilities. • Potential to conflict or inconsistency with CEQA Guidelines at Section 15064.3(b).
Tribal and Cultural Resources	• Potential impacts associated with substantial adverse changes in the significance of a tribal cultural resource, sacred place, or object with cultural value to a California Native American Tribe as a result.
Utilities and Service Systems	• Potential impacts associated with the relocation or construction of expanded electrical power or telecommunications facilities, the construction or relocation of which could cause significant environmental impacts.
Wildfire	• Potential impacts associated with the installation or maintenance of associated infrastructure that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment (e.g., battery storage and maintenance).

Source: AEP, 2024 (Appendix G, CEQA Checklist); Mead & Hunt, Inc. 2024.

The discussion above does not suggest that proposed AAM projects will result in the potential impacts identified in **Table 13**, but proposed AAM projects will need to consider these items early during project planning and design to avoid or reduce potential effect.

Aircraft Noise Analysis

While electric- or hydrogen-powered aircraft will result in comparatively less aircraft noise exposure than conventional aircraft, the type of noise will be unfamiliar to potential sensitive receptors, including those living and working

near airports. Forthcoming noise analyses will need to consider the variation in noise characteristics associated with AAM and both the lateral and vertical separation required to reduce noise exposure to less than significant levels in accordance with federal and state guidance.

Supplemental Environmental Guidance

Modifications may be required to current federal and state regulations and guidance pertaining to land use compatibility that focus on airports and heliports as described in the following section. State and local agencies responsible for the review, adoption, or certification of CEQA documents associated with proposed AAM facilities and operations might not be familiar with aviation/AAM or the methodologies available for evaluating potential aviation/AAM-related environmental effects. Supplemental materials would help outline potential environmental and social effects of proposed AAM projects, including guidance and approaches for reviewing AAM-related projects and environmental analyses prior to decision-making. Such non-regulatory guidance could be distributed to project proponents to avoid and minimize potential environmental and social affects during project planning and design.

9.4.2 Review and Amend the California Airport Land Use Planning Handbook to Address AAM

The SAA requires the creation of Airport Land Use Commissions (ALUCs), and ALUCs are responsible for the preparation and adoption of land use compatibility plans to:

- Ensure the orderly expansion of airports.
- Ensure the adoption of appropriate land use measures that minimize the public's exposure to excessive noise and safety hazards within areas around public airports to the extent that these areas are not already devoted to incompatible uses.

Task
Review and Amend the California Airport Land Use Handbook to Address AAM
Responsibility
Caltrans
Timeframe
Year 1: Month 7 to Year 2: Month 6 (1 year duration)

Pursuant to the SAA, Caltrans is responsible for publishing guidance, referred to as the *Airport Land Use Planning Handbook* (Handbook), to support ALUCs in the preparation and adoption of their land use compatibility plans. The SAA identifies the types of land use actions that shall be referred to an ALUC for a determination of consistency with the applicable ALUCP prior to their approval by a local agency including:

- Adoption or modification of an airport master plan for an airport included in the ALUCP.
- Any proposal for airport expansion, if such expansion will require an amended Airport Permit from the State of California.
- Any proposal for construction of a new airport or heliport.

Since a public-use heliport is considered a public-use airport under the SAA, it seems likely that the construction of a new vertiport or the modification of an existing aviation facility to support vertiport operations would trigger the need for a new or modified Airport Land Use Compatibility Plan (ALUCP).

Potential Revisions to ALUC Guidance

ALUCPs consider four compatibility factors or concerns: noise, safety, overflight, and airspace. Based on the nature of AAM operations, which may include the AAM of vertiports in densely populated areas, new strategies, policies, and metrics may be necessary to identify/reduce the effects of aircraft operations on those living and working near vertiports. In addition, the role of existing, incompatible land uses may require reconsideration as vertiport siting is proposed in locations outside of existing aviation facilities.

New criteria may be required in association with safety, as vertiports may be sited in areas not formerly associated with aviation, and overflight, as aircraft will fly at low levels and in new locations. The Handbook should be reviewed to identify the potential compatibility concerns associated with proposed vertiport siting and AAM operations. Supplemental guidance or a revised Handbook should be prepared and distributed to ALUCs and ALUC staff prior to AAM infrastructure and deployment in 2028.

9.5 Include AAM in the California Transportation Plan

Task
Include AAM in the CTP Integrate AAM into a future CTP update
Responsibility
CalSTA Caltrans
Timeframe
Years 1 through 3

The California Transportation Plan (CTP) provides a common framework for guiding transportation decisions and investments by all levels of government and the private sector. It is Caltrans' responsibility to work with stakeholders and the public to update the CTP every five years. The component modal plans that support the CTP are updated at regular intervals to comply with federal regulations and guidance.

- The CTP 2050 was completed in February 2021, indicating that a new or revised CTP will be completed in the 2026 timeframe. The anticipated deployment of AAM could be incorporated into the next CTP.
- The California Aviation System Plan was last updated in 2021 and requires revision every five years. The envisioned role of AAM in the State's aviation system, including proposed infrastructure needs and anticipated deployment, should be addressed by the plan.
- The State Freight Plan, Rail Plan, and Interregional Transportation Strategic Plan are revised every four years. Opportunities to incorporate AAM into these facilities should be identified as use cases are developed for implementation.

9.6 Facilitate Outreach to Agencies and Communities

Caltrans should work to provide and distribute outreach material to educate local agencies about forthcoming AAM deployment. In addition, Caltrans should provide materials for agencies to use when conducting outreach to local communities, neighborhoods, and underserved communities and to further the State's equity goals.

9.6.1 Create a Public Education and Outreach Framework for Local Agencies to Learn about AAM

Task
Conduct Outreach to Local and Regional Planning Agencies
Responsibility
Caltrans
Timeframe
Year 2: Months 1 through 6

AAM offers a new ecosystem that diverges from traditional aviation technologies and operations that will be unfamiliar to local agencies and the public. It will be incumbent upon Caltrans to provide educational materials and guidance to counties, cities, and Regional Transportation Agencies (RTPAs) about the forthcoming AAM ecosystem prior to deployment.

Numerous agencies have prepared materials that can be used for education and outreach to diverse stakeholders. It is likely that many of these materials can be provided with little or no change. Resources that can be used to provide outreach to counties, cities, and RTPAs include, but are not limited to:

- *AAM Playbook*, which includes brief video presentations by NASA pertaining to use cases, AAM infrastructure, noise, safety, and accessibility. The playbook is available at. https://www.nasa.gov/centers-and-facilities/armstrong/nasa-is-creating-an-advanced-air-mobility-playbook-2/
- *Advanced Air Mobility and Community Outreach: A Primer for Successful Stakeholder Engagement, Airport Cooperative Research Report No. 261*. The primer provides introductory material on AAM, Stakeholder and Community Engagement Strategies, and a Stakeholder Engagement Toolkit. The resource is available at: https://nap.nationalacademies.org/catalog/27627/.
- *Planning for Advanced Air Mobility, Planning Advisory Service Report 606*. The report presents planners and policymakers with the foundational knowledge to understand important considerations for AAM development and potential community impacts. It provides information for the public sector to integrate AAM into planning and policymaking at the local and regional levels of government, and it highlights the need for greater awareness about AAM and its potential impacts among communities, which may have little prior experience with aviation planning issues.

It is recommended that Caltrans representatives or their designees gather educational materials and provide outreach presentations for the following organizations in advance of AAM deployment:

- League of California Cities
- California State Association of Counties (CSAC)
- Regional Transportation Planning Agencies
- Metropolitan Planning Organizations

9.6.2 Distribute Best Practices to Assist Local Agencies with Community and Public Outreach

Following the Public Education and Outreach Framework for Local Agencies identified in Section 8.6, Caltrans should prepare materials for local agencies to engage with communities and neighborhoods about forthcoming AAM deployment.

As summarized in Section 7, considerable research has been undertaken to develop materials for local communities. The proposed Community Handbook could identify and incorporate materials from these and other documents and address potential equity concerns associated with AAM.

Task
Distribute Best Practices to Assist Local Agencies with Community and Public Outreach Prepare material to assist with local engagement and examples where this has occurred successfully.
Responsibility
Caltrans LCI
Timeframe
Year 2: Months 7 through 12

To further efforts to enable AAM to benefit underserved communities, the state should consider opportunities for collaboration similar to the Living Labs model, which engaged with underserved communities and stakeholders such as from industry, academia, K-12 schools, and community-based stakeholders. A good first test case is NASA's Hollister Project where NASA, industry, and LCI are working together to provide outreach and education while making sure that the voices of underserved communities are heard.

9.7 Establish Best Practices for AAM Planning and Evaluation at the Local Level

Following initial outreach to local agencies described in Section 8.6, LCI, CalSTA and Caltrans should collaborate to provide guidance and best practices to local planners and decisionmakers about the review of proposed AAM-related projects prior to decision making. The guidance should include references for associated regulations and guidance to address such topics as:

- Vertiport Siting and Permitting Requirements
- Necessary Federal, State, and Local Reviews
- Land Use Considerations
- Community/Public Outreach
- Equity Assessment
- Vertiport Safety and Security (hazardous materials, fire protection, data, and passenger security, etc.)
- Environmental Review
- Airport Land Use Commission Review
- FAA Airspace Review (Form 7460)

Task
Establish Best Practices for AAM Planning and Evaluation at the Local Level Prepare and Circulate Best Practices for AAM Project Review
Responsibility
CalSTA Caltrans LCI
Timeframe
Year 2: Months 7 through 12

The best practices should include reference materials, contact information, questions, and further assistance.

9.8 Facilitate Ongoing Collaboration Among Agency and Industry Stakeholders

Ongoing coordination will be essential as AAM evolves, and numerous working groups have been developed to bring agencies, professional organizations, and industry representatives to a common table to exchange ideas including, but not limited to:

- **AAM Interagency Working Group:** The USDOT has convened a nationwide working group to further AAM. The working group provides webinars for stakeholders nationwide.
- **AAM Multistate Collaborative:** Nearly 30 states and the National Association of Aviation Officials (NASAO) participate in the AAM Multistate Collaborative to work toward consensus on key AAM policy issues and how state governments can support AAM deployment to complement AAM efforts.
- **American Association of Airport Executives (AAAE) Operations, Safety, Planning and Emergency Management Committee:** AAAE hosts monthly seminars that are attended by hundreds of aviation and industry professionals. The webinars focus on new technologies and include a focus on AAM, its component technologies, and its potential effect on aviation and airports.
- **Monterey Bay Drone, Automation and Robotics Technology (DART):** Established in the Monterey Bay Tri-county Region of Monterey, San Benito and Santa Cruz counties, DART is a non-profit organization dedicated to statewide advancement of uncrewed aerial systems and advanced air mobility (AAM) sectors, with a focus on employment development and infrastructure.

Task

Establish an AAM Forum for Ongoing Collaboration

Establish a statewide forum for broad collaboration among state agencies, OEMs, and industry stakeholders.

Participate in ongoing federal, state, professional, and AAM industry working groups.

Responsibility

CalSTA

Caltrans

LCI

GO-Biz

CARB

CEC

Timeframe

Years 1 through 3

Caltrans, CalSTA, and GO-Biz should collaborate to establish a forum for other state agencies, industry professionals, and others to pursue the state's ongoing efforts toward zero-emission aviation, including AAM. The forum could work together to explore California's role as a leader in the development and implementation of AAM, supporting technology, and economic development including job creation. Participants could include members of the SB 800 advisory group and expand to include diverse membership from other state agencies, OEMs, and industry professionals prior to AAM deployment. In addition to creating a specific forum, CalSTA and Caltrans should promote participation in existing interagency efforts, such as the AAM Working Group, Multi-state Collaborative, AAAE, and other organizations.

10.0 CONCLUSION

Collaborations between agencies and industry stakeholders will be an ongoing effort to pursue AAM development and achieve the broader goals of zero-emission aviation. California's existing multimodal infrastructure offers numerous opportunities to support initial AAM operations. Some of California's airport facilities may be equipped to support emerging aircraft, including conventional takeoff, short takeoff and landing, and vertical takeoff and landing. Besides mobility and accessibility benefits, AAM is expected to provide lower emissions and quieter operations compared with other current travel alternatives. It also raises equity-based considerations such as accessibility to services, environmental and socioeconomic effects on nearby communities. State and local agencies will need to consider FAA direction and guidance as they review and update relevant laws, procedures, and land use approvals to safely implement AAM in their jurisdictions. More complex AAM operations and a broader AAM ecosystem will require collaboration among multiple state and local agencies to identify priorities, protect airspace and ground safety, navigate new site approvals, and address challenges associated with diverse funding sources for infrastructure maintenance and upgrades – including vertiport space and energy needs.

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12.0 ACRONYMS

Acronym	Definition
A&D	Acquisition and Development
AAAE	American Association of Airport Executives
AAM	Advanced Air Mobility
AAMIWG	AAM Interagency Working Group
AC	FAA Advisory Circular
ACRP	Airport Cooperative Research Program
ADA	the Americans with Disabilities Act
AEP	Association of Environmental Professionals
AFDC	Alternative Fuels Data Center
AFR	Autonomous Flight Rules
AIA	Airport Influence Area
AIM	Aeronautical Information Manual
AIP	FAA Airport Improvement Program
ALP	Airport Layout Plan
ALUC	Airport Land Use Commission
ALUCP	Airport Land Use Compatibility Plan
APA	American Planning Association
ARFF	Aircraft Rescue and Firefighting
ARFVTP	Alternative and Renewable Fuel and Vehicle Technology Program
ATC	Air Traffic Control
ATCT	Air Traffic Control Tower
BIL	Bipartisan Infrastructure Bill
BIPOC	Black, Indigenous, and People of Color
BMP	best management practices
CA	California
CAAP	California Aid to Airports Program
CalEPA	California Environmental Protection Agency
CalSTA	California State Transportation Agency
CalSTRAT	California Strategies, LLC
CAMI	Community Air Mobility Initiative
CAPTI	Climate Action Plan for Transportation Infrastructure
CARB	California Air Resources Board

CASP	California Aviation System Plan 2020
CATEX	Categorical Exclusion
CAV	Connected and Autonomous Vehicles
CCR	California Code of Regulations
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CFMP	California Freight Management Plan
CFR	Code of Federal Regulations
CHSR	California High-Speed Rail
CIP	Capital Improvement Program
CNEL	California Noise Equivalent Levels
COEHHA	California Office of Environmental Health and Hazard Assessment
CONOPS	FAA Concept of Operations
COP	United Nations Climate Changed Conference
CSAG	California State Association of Counties
CTC	California Transportation Commission
CTOL	Conventional Takeoff and Landing aircraft
CTP	California Transportation Plan 2050
DEP	Distributed Electric Propulsion
DOE	United States Department of Energy
EB	FAA Engineering Brief
EIT	European Institute of Innovation and Technology
EMS	Emergency Medical Services
EPA	United States Environmental Protection Agency
EQI	Caltrans Transportation Equity Index
ESRI	Environmental Systems Research Institute, Inc.
EV	Electric Vehicle
eVTOL	Electric Vertical Takeoff and Landing aircraft
EVSE	Electric Vehicle Supply Equipment
FAA	United States Department of Transportation, Federal Aviation Administration
FATO	Final Approach and Takeoff Area
FBO	Fixed-based Operators
FHWA	Federal Highway Administration
FRA	Federal Railroad Administration

FTA	Federal Transit Administration
FY	Fiscal Year
GHG	Greenhouse Gas
GIS	Geographic Information System
HR	House of Representatives
I28	Innovate28
IAP2	International Association for Public Participation
IEEE	Institute of Electrical and Electronics Engineers
IFR	Instrument Flight Rules
ITSP	Interregional Transportation Strategic Plan
KIC	Knowledge and Innovation Community
kW	kilowatt
kWh	kilowatt-hour
LA	Los Angeles
LCI	Governor's Office of Land Use and Climate Innovation
MaaS	Mobility as a Service
MOU	Memorandum of Understanding
MRO	Maintenance, Repair and Overhaul Service
MW	megawatt
NAS	National Airspace System
NASA	National Aeronautics and Space Administration
NASAO	National Association of Aviation Officials
NEPA	National Environmental Policy Act of 1969
NIA	National Institute of Aerospace
NPIAS	FAA National Plan of Integrated Airport Systems
NREL	National Renewable Energy Laboratory
OEM	Original Equipment Manufacturers
OPR	California Governor's Office of Planning and Research
P3s	Public/Private Partnerships
PAB	Private Activity Bonds
PFC	Passenger Facility Charge
PL	Public Law
PSU	Providers of Service for UAM
PUC	California Public Utilities Code
RAM	Regional Air Mobility

RTPA	Regional Transportation Agency
SA	Safety Area
SAA	State Aeronautics Act
SB	Senate Bill
SHS	State Highway System
SRRA	Safety Roadside Rest Areas
STOL	Short Takeoff and Landing aircraft
sUAS	Small Unmanned Aircraft Systems
TAC	Technical Assistance Committee
TLOF	Takeoff and Liftoff Area
U.S.	United States
U.S.C.	United States Code
UAM	Urban Air Mobility
UML	Urban Air Mobility Maturity Levels
USDA	United States Department of Agriculture
VFR	Vertical Flight Rules
VHF	Very High Frequency
VMT	Vehicle Miles Traveled
VTOL	Vertical Takeoff and Landing aircraft
ZEV	Zero-emissions Vehicle