

CITRIS Aviation Roadmap Overview

Executive Summary

In 2021, the Center for Information Technology Research in the Interest of Society and the Banatao Institute (CITRIS) launched [CITRIS Aviation](#), a research initiative to advance, through the broad use of novel Information Technologies, cutting-edge aviation, applications, and policies across the University of California [campuses](#) at Berkeley, Davis, Merced and Santa Cruz.

Across its four campuses, CITRIS - associated faculty and staff have strengths in technology and application areas such as Aerospace, Drones, Controls, Air Traffic, Uncrewed Flight, Remote Sensing, Environmental Monitoring, Agriculture, Urban Air Mobility, Regulatory Partnerships, and Policy.

After interviewing more than 25 faculty & staff, we launched CITRIS Aviation with a thematic focus on “Aviation for a Changing Planet” to incorporate the breadth of CITRIS’s interdisciplinary information technology research and unique strengths in connecting our world-class research with technology and industry. This overview outlines key areas for focus.

Roadmap Objectives

The goal of the following Roadmap is to set long-term and short-term strategic milestones and recommendations in order to launch and sustain a successful Aviation initiative within CITRIS.

Priority Areas

1. [Leading edge research investments](#)
2. [Environmental Monitoring](#)
3. [Sustainable transportation & delivery](#)
4. [Policy & Regulation](#)
5. [Equitable student engagement & workforce training](#)
6. [Facilities & Infrastructure](#)

1. Leading-edge research investments

As one of CITRIS’ flagship programs, the CITRIS Seed Funding program has invested in cross-disciplinary

collaboration on innovative research and applied projects across UC campuses, including aviation-related research. Topics like decarbonizing transportation, wildfire mitigation, and climate change are also emphasized in CITRIS's [RFP for Core Seed Funding](#) program.

Recommendations:

- CITRIS will continue to prioritize and promote Core Seed Funding opportunities to Aviation faculty and staff.
- We will map the emerging and incumbent organizations in aviation communities of practice (funders, operators, suppliers, training providers), define a strategy and set of profiles to guide CITRIS Aviation's partnership formation, and perform a SWOT (strengths, weaknesses, opportunities and threats) analysis to define CITRIS/UC's unique contribution to this dynamic sector.
- CITRIS will develop strategic donor and industry partnerships for future funding, with specific funding for Aviation-related seed grants in mind, particularly in timely cross-functional areas such as decarbonization and wildfire mitigation.

2. Environmental monitoring

CITRIS can help support faculty and staff to track and adapt to the effects of climate change by providing tools and platforms to monitor wildfire, water levels and quality, rising coastlines, agricultural production, and more.

Recommendations:

- Identify potential cross-sector collaborators to accelerate CITRIS Aviation's entry into and impact on the Environmental Monitoring arena. Consider government agencies, startups, and community partners.
- Continue to support tool development and training for environmental monitoring initiatives such as those focused on wildfire mitigation.

3. Sustainable transportation & delivery

Aviation is on track to become one of the top polluters and causes of climate change of any industry in the world if we do not take mitigating action. Developing low-cost, sustainable transportation and delivery may be one of the most important areas of focus for CITRIS Aviation. In particular, flights of less than 600 miles account for more than 17% of total airline emissions.¹ Technologies such as electric, hybrid electric,

¹ Timothy Reuter and David Hyde, "Creating zero-emission aviation with hydrogen and electric power," World Economic Forum, 29 July 2021. <https://www.weforum.org/agenda/2021/07/targeting-true-net-zero-aviation/>

and green hydrogen—powered propulsion can play a key role in decarbonizing aviation. We also need technology that reduces noise pollution to make emerging technologies like air taxis viable.

While CITRIS campuses have faculty expertise in research areas like computational fluid dynamics (Prof. Seongkyu Lee, UCD) and green hydrogen (Prof. Tim Lipman, UCB) as well as battery technologies (Prof. Scott Moura, UCB), the opportunities for CITRIS to make a positive impact on Sustainable Transportation and Delivery are less defined than research areas like Environmental Monitoring. Specific research areas include low-carbon batteries and fuels, low-noise aircraft design, development of noise-reduction techniques, passive/active flow control, low-noise flight optimization, tool development and validation, multi-disciplinary design, analysis, and optimization as well as research with communities and municipalities to test these new technologies.

Recommendations:

- Investigate research areas and identify faculty who can help CITRIS leaders understand where we can make the most significant impact.
- Organize a cross-sector workshop to surface and prioritize high-impact research questions in Sustainable Transportation & Delivery (in contrast with predominantly economic or infrastructure-based drivers of this domain, which CITRIS Aviation has less leverage over).
- Build funding and other partnerships to nurture and accelerate growth of these opportunities.

4. Policy & Regulation

To advance Aviation policies, CITRIS Aviation is working with the [CITRIS Policy Lab](#), the [UC Center of Excellence on Unmanned Aircraft System Safety](#), and other governmental and non-governmental stakeholders to identify and discuss key policy initiatives that would benefit from CITRIS's interdisciplinary IT research and unique strengths in connecting our world-class research with policymakers and industry. Since laws, regulations, and policies often take years to develop, CITRIS seeks to focus initially on California where CITRIS can have a measurable impact in the short- to medium-term.

Recommendations:

- Research and prioritize 1-2 key policy issues to focus on initially. Policy areas could include: Addressing aviation workforce shortages by increasing diversity, making commercial aviation more sustainable, responding to California's wildfires, and harmonizing policies for drone flight in California.
- Explore opportunities with existing partners (e.g., Moffett Field, Merced Vernal Pool Reserve) to pair policy work with CITRIS's aviation infrastructure to serve as a regulatory testbed for innovative aviation startups and technologies.

5. Equitable student engagement & workforce training

There is an immediate opportunity to engage current students on CITRIS campuses as well as supplement commercial pilot training for semi-autonomous and electric flight. It is also crucial to expand access to these emerging fields by attracting and nurturing participants from diverse ethnic and socio-economic backgrounds through programs like drone camps and academies that serve students at the university and high school levels.

Recommendations:

- Continue supporting initiatives like the CITRIS Aviation Prize to engage current university students across CITRIS campuses.
- Identify ways to enable current successes with Drone Academies (UCD) and Drone Camp (UCSC) to scale their impact across all campuses.
- For equitable workforce training, work with faculty and staff to identify the best opportunities (e.g., new pilot training) where CITRIS can make the biggest impact.
- Develop a lightweight tool or survey to assess participation outcomes among students and workforce trainees (i.e., change in skills, attitudes, career trajectories).
- Build on the CITRIS [Workforce Innovation Program](#) to increase student involvement in aviation-related fields.

6. Facilities & Infrastructure

“Aviation needs air space...and the new aircraft manufacturers are not in Detroit. They're in Santa Cruz...air space needs a public-private partnership.”

- Prof. Raja Sengupta, UC Berkeley

One of the most underutilized resources is the existing aviation infrastructure on CITRIS's four campuses: from UC Berkeley's Richmond Field Station and new Moffett Field development to UC Merced's 7,000 acre Vernal Pool to the UC Davis Airport and UC Santa Cruz's MBEST & Airspace Integration Facility. Developing a strategic plan for how to unlock the power of these facilities for UC and industry research, represents a huge opportunity.

Recommendations:

- Short term: Update our Inventory of Aviation Assets and begin identifying potential industry partnerships.
- Over time, leverage relationships with industry partners and donors to plan and advocate for the future needs of aviation programs.
- Consider developing capacity for CITRIS Aviation infrastructure to serve as one or more testbeds for validating new software and hardware. Such testing is needed to satisfy regulators, operators and consumers.