Key Recommendations for the Future of Drone Computing

A CCC Computing on the Fly Report Brief

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Visioning

In December 2025, the Computing Community Consortium's (CCC) **Computing on the Fly: Navigating a Vision for the Future of Drone Computing** workshop convened 47 experts from academia, industry, and government to assess the potential of AI-powered drones for non-military use by 2035 and identify critical barriers to realizing that future. Collectively, the attendees agreed that greater computational support for drones could unlock transformative applications, from wildfire detection and suppression to reliable rural medical supply chains to AI-driven public safety response. However, to realize this future, core research challenges in computing, networking, security, AI, and policy must be addressed.

Action is Critical

Following the recommendations in this brief positions the United States to:

- Unlock new markets ranging from $5-15B
- Maintain technological leadership as international competitors pursue autonomous systems markets
- Address national priorities like the $150B annual weather disaster burden, labor shortages in critical areas, and national security requirements for autonomous systems

Failure to proactively invest in drone computing by 2028 risks:

- Ceding technological leadership to international competitors investing aggressively
- Widening gap between lab innovation and deployment-ready trustworthy autonomy
- Missed economic opportunities as regulatory uncertainty and technical limitations constrain commercialization
- Inability to address urgent national challenges (infrastructure deterioration, natural disasters, rural healthcare access) where autonomous drone solutions could provide transformative impact

Key Recommendations

Stakeholder	Recommendations
Research Funders Near-peer competitors are out-investing the U.S. in autonomous systems' integration, threatening American leadership in a foundational technology layer. Cross-agency coordination is essential to accelerate autonomous systems' integration and maintain American leadership in a foundational technology layer.	NSF should lead foundational research while mission agencies (USDA, DOT/FAA, FCC, DOD) ensure applications address real-world constraints and national priorities. Establish a national testbed consortium enabling reproducible research across diverse platforms and environments, serving 20 universities and 100+ industry partners. Fund integration platforms that compose AI agents into safety-critical systems.
Researchers Autonomous drone research demands collaboration between traditionally separated research communities in robotics, networking, AI, security, and human-computer interaction.	Break disciplinary silos to address the systems integration talent gap. Fewer than a dozen graduate programs currently produce engineers with combined AI-aerospace-security expertise, yet the DOD Replicator Initiative alone will require thousands of such specialists. Engage with real deployments to understand practical constraints — particularly the labor shortage in aviation and infrastructure inspection that creates immediate demand for autonomous solutions. Share datasets and frameworks to accelerate collective progress and avoid duplicative effort across institutions.
Industry U.S. industry participation is essential to maintain technological leadership as international competitors aggressively pursue autonomous systems markets — particularly in Asia and Europe where regulatory experimentation is advancing rapidly.	Open standards enabling interoperability could reduce integration costs by 40-60% based on precedents from wireless and automotive sectors, accelerating time-to-market and enabling smaller companies to participate. Participate in testbed consortia to validate approaches on real hardware and influence standards development.

Stakeholder	Recommendations
	Share integration experiences and failure mode learnings that can inform research directions and prevent others from repeating costly mistakes. Invest in workforce development for the interdisciplinary systems engineers this future requires, partnering with universities to shape curricula around industry needs. *Critically*, domestic drone production must scale. Within the United States, few companies produce programmable consumer drones capable of adopting advanced drone computing technologies. Working with policymakers, industry must commit to end-to-end pipelines for development, deployment, and low-cost operation of drones. Expanding domestic manufacturing capacity strengthens supply chain resilience, addresses sovereignty concerns, and enables the rapid iteration and learning essential for competitive advantage in this emerging domain.
Policymakers Policymakers must prioritize regulatory environments conducive to drone production and operation at scale.	Adopt proactive rather than reactive frameworks across three pillars: • Operator licensing and training • Vehicle certification and maintenance • Traffic management, spectrum allocation, airspace design Safe experimentation frameworks are essential to enable solutions addressing the $150B annual weather disaster burden while maintaining public safety. Regulatory sandboxes can accelerate innovation while managing risk. Coordinate internationally to ensure U.S. leadership in this strategic domain — policy harmonization with allies prevents market fragmentation while maintaining security advantages over adversaries. Initial stakeholder sessions detailing the current bottlenecks and barriers to drone production and operation at scale could inform critical decisions in the coming years.

Read the Full Report

For a fuller picture of the impact and possibilities of drone computing, as well as milestones and extended timelines for action, we encourage all members of the computing community to read the **Computing on the Fly: Navigating a Vision for the Future of Drone Computing** report.

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