



MISSISSIPPI STATE
UNIVERSITY™

AGRICULTURAL AUTONOMY INSTITUTE

MSU Spray Drone Update

2024 Row Crop Short Course

December 10, 2024



MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute

Historical Perspective - 2017



MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute

Historical Perspective - 2024



MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute

Drone Tech/Regulations = **Moving Target**



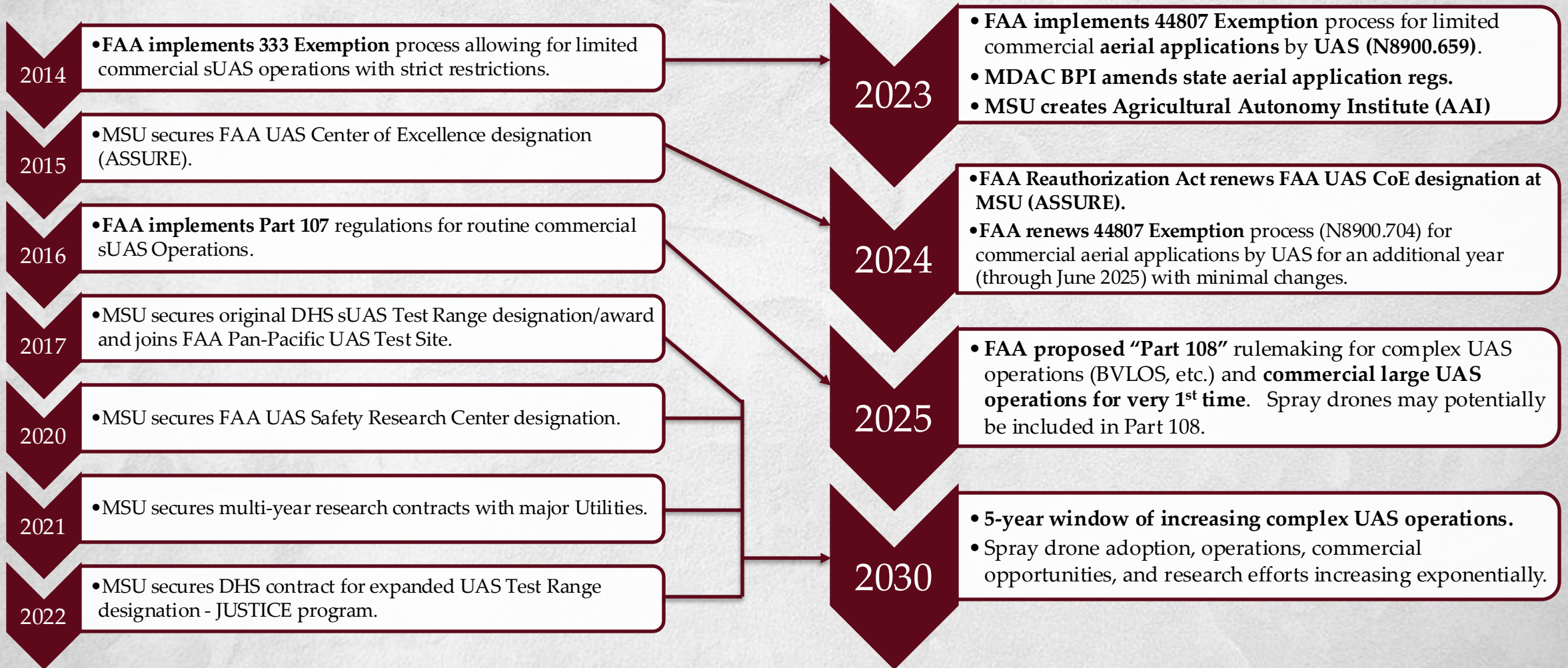
MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute

Then

~ 9 years of increasing
MSU UAS research and operations

Now & Future...



Then

~9 years of increasing
MSU UAS research and operations

Now



- 2016 - 2019
- Earliest operations of GA Outlaw G2 UAS.
- 14 ft. wingspan, 180 lbs. MTOW



- 2019 - 2022
- Earliest operations of NASC Tigershark UAS.
- 22 ft. wingspan, 515 lbs. MTOW



- 2022 - Present
- Earliest operations of NASC Teros UAS.
- 40 ft. wingspan, 1,200+ lbs. MTOW



MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute

United States Department of Transportation

Federal Aviation Administration

About Jobs

Aircraft Air Traffic Airports Pilots & Airmen

Home

Drones by the Numbers (as of 10/1/24)

<p>< 1% of all registered UAS.</p> <p>< 2% of registered commercial UAS.</p>	791,597
	Drones Registered
	396,746
	Commercial Drones Registered
	387,746
	Recreational Drones Registered
	7,523
	Paper Registrations
+1,090 paper registrations since 5/31/24 (6,433).	415,635
	Remote Pilots Certified

Where we are “NOW”

- Small UAS = “DroneZone” online registrations (FA#).
- Large UAS = Paper registrations (N-#) same as traditional manned aircraft registration.
- “Tip of the iceberg” for spray drones and for commercial large UAS operations in general. This is only the beginning.
- “Tip of the spear” represented by agricultural early adopters of spray drones in Mississippi and the greater U.S. Southeast and Midwest regions.



Ongoing Research

- Measuring application efficacy of both liquid and solid payload applications.
- Measuring & mitigating off-target drift.
- Validating aircraft specifications and real-world operational performance.
- Evaluating **U.S.-made UAS platforms.**
- Supports larger vision for MSU-led UAS Aerial Applications training program in collaboration with FAA, USDA, NAAA, and Delta State University's Ag Aviation Career Pathway Program.



AG-230



KEY SPECIFICATIONS

8.0 Gallons total (2 x 4.0 Gallons)	UP TO 35 foot swath width	UP TO 50 acres/hr @ 1 GPA Rate
--	--	---



PrecisionVision 40X

UNMANNED AIRCRAFT SYSTEM (UAS)

Ongoing Research

- Hyllo AG-272
 - 18 gal. payload capacity
 - 400 lbs. GTOW
 - Flight demonstration December 11th @ North Farm.
 - Thank you to MSU Foundation, Eubanks Produce, and Rival Drone Works.



- 24' Spray Drone Trailer
 - Enclosed/Climate controlled for transit and operations support.
 - Open area for tanks, hoses, & loading.
 - Reinforced roof for flight deck.
 - Fully self-contained spray drone flight operations.



Now

5 - 10 years increasing
Spray Drone research at MSU

Future



- 2023 - Present
- Early operations of MSU Spray Drone fleet (all made in USA).
- 3 – 18 gal. payloads, 50 – 400 lbs. GTOW.



MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute

Ongoing Research & Urgent Needs:

1. UAS Applicator Training & Certification!
2. Low-Altitude Airspace Deconfliction!



EXPO TO HIGHLIGHT RASPET'S AG AVIATION ANALYSIS, UAS INFLUENCE



A turbine-powered ag plane makes a spray pass. The agricultural aviation industry treats 127 million acres of cropland aerially each year (Photo courtesy National Agricultural Aviation Association).

Contact: [Chris Bryant](#)

STARKVILLE, Miss. – A national agriculture trade show will highlight recent ag aviation research by a Mississippi State flight lab during a Dec. 6 panel discussion in Savannah, Georgia.

The National Agricultural Aviation Association invited Madison Dixon, research director at MSU's Raspert Flight Research Laboratory, to present the lab's findings during the [Ag Aviation Expo](#), billed as the premier trade show for agricultural aviation



MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute

Key Considerations

- State & Federal Regulations equally important. State aerial application regulations amended by MS Bureau of Plant Industry on December 3, 2023.
- BPI Drone Frequently Asked Questions (FAQs) worksheet: <https://agnet.mdac.ms.gov/agManage/uploads/1474.pdf>
- Coordinate with local ag aviators ahead of time whenever and wherever possible. Trust and mutual respect among operators/applicators is badly needed.
- Be aware of the pending restrictions on DJI and other foreign manufactured UAS.
- Hylio AG-272 flight demonstration on Wed., December 11 @ 1:30 p.m. at North Farm (weather permitting).

The screenshot displays the CONGRESS.GOV website interface. At the top, there are navigation links for 'Advanced Searches' and 'Browse', along with utility links for 'Search Tools', 'Support', and 'Sign In'. A search bar is present with a dropdown menu set to 'Legislation' and a search icon. Below the search bar, the breadcrumb trail reads 'Home > Legislation > 118th Congress > H.R.2864'. The main heading is 'H.R.2864 - Countering CCP Drones Act', with a sub-heading '118th Congress (2023-2024) | Get alerts'. A 'BILL' tab is active, and a 'Hide Overview' button is visible. The 'Tracker' section shows a progress bar with stages: 'Introduced', 'Passed House' (highlighted), 'Passed Senate', 'To President', and 'Became Law'. The 'Latest Action' section states: 'Senate - 09/10/2024 Received in the Senate and Read twice and referred to the Committee on Commerce, Science, and Transportation. (All Actions)'. The 'Sponsor' is 'Rep. Stefanik, Elise M. [R-NY-21] (Introduced 04/25/2023)'. The 'Committees' are 'House - Energy and Commerce | Senate - Commerce, Science, and Transportation'. The 'Committee Meetings' are '03/20/24 10:00AM 03/12/24 2:00PM'. The 'Committee Reports' are 'H. Rept. 118-491'. The 'More on This Bill' section includes links for 'Constitutional Authority and Single Subject Statements' and 'CBO Cost Estimates [1]'. The 'Subject — Policy Area' is 'Science, Technology, Communications' with a 'View subjects >>' link. The 'Give Feedback on This Bill' section includes a 'Contact Your Member' link. At the bottom, there are tabs for 'Summary (2)', 'Text (4)', 'Actions (15)', 'Titles (5)', 'Amendments (0)', 'Cosponsors (15)', 'Committees (2)', and 'Related Bills (0)'. The 'Summary' section is expanded, showing 'Summary: H.R.2864 — 118th Congress (2023-2024)' with a 'Listen' button and a dropdown menu set to 'Reported to House (05/07/2024)'. A note states 'There are 2 summaries for H.R.2864.' and 'Bill summaries are authored by CRS.' The 'Shown Here' section lists 'Reported to House (05/07/2024)' and 'Countering CCP Drones Act'. A disclaimer at the bottom states: 'This bill requires the inclusion of telecommunications and video surveillance equipment or services produced or provided by Shenzhen Da-Jiang Innovations Sciences and Technologies Company Limited (a Chinese drone maker commonly known as DJI Technologies) on a list of communications equipment or services determined by the Federal Communications Commission (FCC) to pose an unacceptable risk to U.S. national security. Current law prohibits the use of federal funding available through specified FCC programs for purchasing or maintaining listed equipment or services.'



DJI, Autel drones under fire: NDAA 2025 raises stakes



Ishveena Singh

Dec 9 2024 - 5:19 am PT

0 Comments



The long-anticipated **final text** of the National Defense Authorization Act (NDAA) for fiscal year 2025 has been released, setting the stage for a potential ban on Chinese-manufactured drones. Negotiated between House and Senate lawmakers, the legislation incorporates the provisions of the **Countering CCP Drones Act** — targeting not just drone makers **DJI** and **Autel Robotics**, but also their subsidiaries, affiliates, and licensors.

At the heart of the debate is a proposal to add DJI to the Federal Communications Commission's (FCC) Covered List. This move would **ban DJI drones from operating** on US communications infrastructure, citing national security risks. Proponents of the ban, such as Representative Elise Stefanik, have equated DJI's threat to that of TikTok, alleging that the company's drones could transmit sensitive data to the Chinese government.



MISSISSIPPI STATE
UNIVERSITY™

16 SEC. 1709. ANALYSIS OF CERTAIN UNMANNED AIRCRAFT

17 SYSTEMS ENTITIES.

18 (a) EVALUATION OF COMMUNICATIONS SERVICES
19 AND EQUIPMENT TO COVERED LIST.—

20 (1) IN GENERAL.—Not later than one year
21 after the date of the enactment of this Act, an ap-
22 propriate national security agency shall determine if
23 any of the following communications or video surveil-
24 lance equipment or services pose an unacceptable

December 7, 2024 (4:27 p.m.)

(95294915)

G:\CMTE\AS\25\C\RCP_HR5009.XML

1085

1 risk to the national security of the United States or
2 the security and safety of United States persons:

3 (A) Communications or video surveillance
4 equipment produced by Shenzhen Da-Jiang In-
5 novations Sciences and Technologies Company
6 Limited (commonly known as “DJI Tech-
7 nologies”).

8 (B) Communications or video surveillance
9 equipment produced by Autel Robotics.

DHS & FBI guidance as of Jan. 2024



CYBERSECURITY GUIDANCE: CHINESE-MANUFACTURED UAS

OVERVIEW

Chinese-manufactured unmanned aircraft systems (UAS), more commonly referred to as drones, continue to pose a significant risk to critical infrastructure and U.S. national security. While any UAS could have vulnerabilities that enable data theft or facilitate network compromises, the People's Republic of China (PRC) has enacted laws that provide the government with expanded legal grounds for accessing and controlling data held by firms in China. The use of Chinese-manufactured UAS requires careful consideration and potential mitigation to reduce risk to networks and sensitive information. The Cybersecurity and Infrastructure Security Agency (CISA) and the Federal Bureau of Investigation (FBI) encourage U.S. critical infrastructure owners and operators to procure UAS that follow secure-by-design principles, including those manufactured by U.S. companies. CISA and FBI further recommend following principles and implementing cybersecurity recommendations listed in this guidance to any organization procuring and operating UAS.

THREAT

The White House's 2023 National Cybersecurity Strategy and the Annual Threat Assessment from the Office of the Director of National Intelligence both recognize the PRC as the most advanced, active, and persistent cyber threat to the United States. Their analysis describes how the PRC expanded cyber operations to challenge the global order and U.S. interests. Central to this strategy is the acquisition and collection of data - which the PRC views as a strategic resource and growing arena of geopolitical competition.¹

Since 2015, the PRC has passed or updated comprehensive national security, cybersecurity, and data privacy laws and regulations, expanding their oversight of domestic and foreign companies operating within China.² One of these laws, the PRC's 2017 National Intelligence Law, compels Chinese companies to cooperate with state intelligence services, including providing access to data collected within China and around the world. This includes prominent Chinese-owned UAS manufacturers that the Department of Defense has identified as "Chinese military companies" operating within the United States.³ The 2021 Data Security Law expands the PRC's access to and control of companies and data within China and imposes strict penalties on China-based businesses for non-compliance.⁴ The data collected by such companies is essential to the PRC's Military-Civil Fusion strategy, which seeks to gain a strategic advantage over the United States by facilitating access to advanced technologies and expertise.⁵ The 2021 Cyber Vulnerability Reporting Law requires Chinese-based companies to disclose cyber vulnerabilities found in their systems or software to PRC authorities prior to any public disclosure or sharing overseas. This may provide PRC authorities the opportunity to exploit system flaws before cyber vulnerabilities are publicly known.⁶

The use of Chinese-manufactured UAS in critical infrastructure operations risks exposing sensitive information to PRC authorities, jeopardizing U.S. national security, economic security, and public health and safety.

- **Source:** DHS CISA & FBI
- **Link:** <https://www.cisa.gov/sites/default/files/2024-01/Cybersecurity%20Guidance%20Chinese-Manufactured%20UAS.pdf>



Key Considerations

- What's the “big” deal with spray drones and other large UAS?
- Very first time in history where large UAS are commercially available and operationally viable outside of traditional DOD & DHS missions.
- FAA Part 137 regulatory changes clearly indicate that agriculture will lead the way in domestic large UAS operations via spray drones.
- We must understand and appreciate aviation the same way we do agriculture for this technology to work safely in the long run.





MISSISSIPPI STATE
UNIVERSITY™

AGRICULTURAL AUTONOMY INSTITUTE

Contact Info:

Madison P. Dixon, PMP

Office: 662-325-0622

Mobile: 662-545-9303

mdixon@aai.msstate.edu

Associate Director
Agricultural Autonomy Institute
Pace Seed Technology Lab
Mailstop #9812
650 Stone Blvd.
MS State, MS 39762

www.aai.msstate.edu



MISSISSIPPI STATE
UNIVERSITY™

Agricultural Autonomy Institute