Overview and Update of the Unmanned Aerial Pesticide Application System Task Force (UAPASTF)

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UAPASTF

Using Agricultural Drones for Pesticide Application Continues to Increase

- "The global agriculture drone market is projected to grow from **$4.98 billion** in 2023 to **$18.22 billion** by 2030, at a compound annual growth rate of **20.3%** during the forecast period" (Fortune Business Insights, 2023)
- "As of June 2024, drones have treated over **1 billion acres** of land worldwide. There are currently over 300,000 agriculture drones working worldwide. **3.7 million acres** were sprayed by drone in 2023, across 41 states and 50 crops."
  https://www.ndsu.edu/agriculture/sites/default/files/2025-02/Pesticide%20Applications%20the%20Drone%20Way.pdf
- In the United States, **10.3 million acres** were sprayed using drones in 2024. This represents a substantial increase from 2023, when more than **4 million acres** were sprayed using drone technology – a nearly **158%** year-over-year increase."
  https://americanspraydronecoalition.com/#resources

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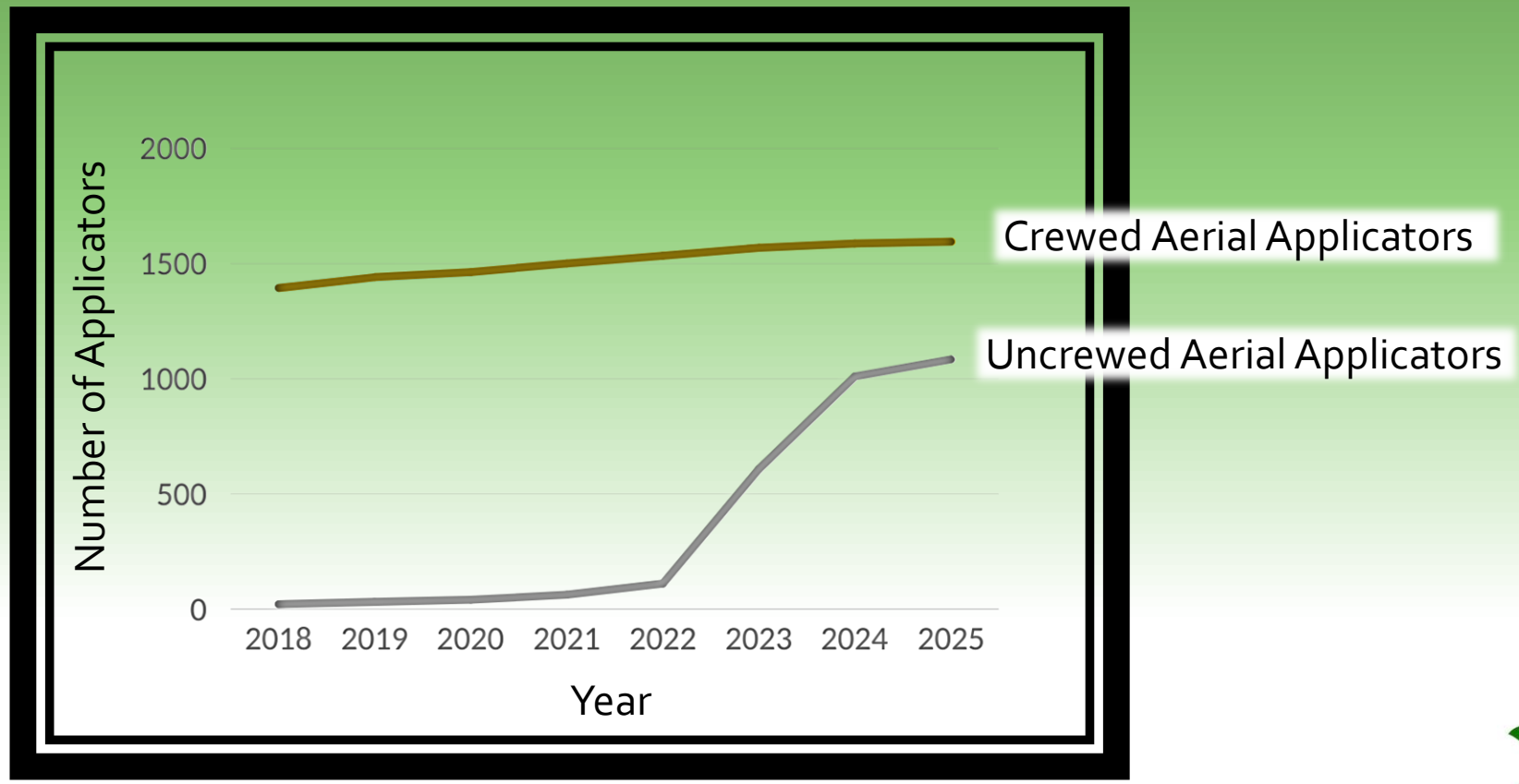
Uncrewed Applicator Numbers are Increasing in the United States

From 2018-2024, crewed aerial applicators have increased by 18%, while uncrewed aerial applicators have increased by over 7000%



AviationDB.net sourcing FAA (Federal Aviation Administration) and NTSB (National Transportation Safety Board) data

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Authorities are generally looking to data on the areas identified in the OECD "State of the Knowledge" Report to inform regulatory frameworks

Drift/offsite Movement

Operator Exposure and Best Practices

OECD "State of the Knowledge" Report

https://www.oecd-ilibrary.org/environment/report-on-the-state-of-the-knowledge-literature-review-on-unmanned-aerial-spray-systems-in-agriculture_9240f8eb-en

Crop Residue

UAPASTF

Unmanned Aerial Pesticide Application System Task Force (UAPASTF), LLC.

- Based in the US - but **global** in its work / focus
- UAPASTF global core mission is to supply regulatory data / information to inform the potential use of UAV-based pesticide application
  - Where appropriate, the UAPASTF will focus on generating data for submission to pesticide regulatory authorities to inform estimates for **off-site movement**, determine **operator/handler exposure**, and assess **crop residue** contributions.
  - This data will be used to conduct human and environmental risk assessments and inform the regulatory approval processes
- UAPASTF interacts with OECD Drone/UASS Subgroup of WPP, regulatory agencies, CropLife, EUPAF & other stakeholders to develop & provide information / data
  - UAPASTF alignment with work of the OECD WPP Drone/UASS Subgroup critical to success
  - Established and seeking collaborative and confidentiality agreements with UAV-application companies and experts (e.g., additional UAV-application companies in other world areas, UAV manufacturers)

Parties interested in the work of, or registrants interested in joining the UAPASTF should contact:
Dr. Travis Bui, Chair, UAPASTF Administrative Committee travis.bui@corteva.com +1 317-431-7892
And/or Rhonda Bichsel, UAPASTF Manager, rhondab@johnsonmgt.com

Unmanned Aerial Pesticide Application Task Force (uapastf.com)

Member Company	*Administrative Committee*	*Technical Committee*
BASF Corporation	Rebecca Willis	**Frank Donaldson (Chair)**
Bayer CropScience LP	**Sarah Hovinga (Vice-Chair)**	Jane Tang
Corteva Agriscience	**Travis Bui (Chair)**	Rajeev Sinha (Vice-Chair)
Gharda Chemicals International, Inc.	**Ram Seethapathi (Treasurer)**	Frank Sobotka
Gowan Company LLC	Raymond Layton	Jason A. McDonald
FMC Corporation	Hector Portillo	Roberto Barbosa
NuFarm Americas Inc.	Patti Turner	Tyler Gullen
Syngenta Crop Protection LLC	Jonathan Nicolas	Jo Davies
Valent U.S.A. LLC	Leslie Garcia	Frank Carey
Task force managers	*Rhonda Bichsel*	*Eric Bruce*

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Unmanned Aerial Pesticide Application System Task Force (UAPASTF)

- *Technical teams actively working*
  - Off-site movement GLP study protocol & trials (Frank Donaldson, BASF)
    - Environmental / Ecological Exposure Subteam (Naresh Pai, Bayer Crop Science)
  - Non-dietary Exposure Sub-team (Edgars Felkers, Bayer Crop Science)
  - Field crop residue project – Agriculture & AgriFood Canada (Sheila Flack, Bayer Crop Science)
  - 'Best practices' guidance (Hector Portillo, FMC & Sarah Hovinga, Bayer Crop Science)

Field Drift Studies – Data Generation Plan

Globally focused Good Laboratory Practice (GLP) program

- Repeatable experiment to compare drift behavior across locations
- Same CRO & UAV pilot/consultant at each location
- DJI T30 used as benchmark UAV; hydraulic nozzles compared to ground
- Each UAV treatment followed by a ground sprayer (with same spray quality)
- Nozzles to produce three spray qualities (Fine, Medium, Coarse)
- In-line pressure gauges to confirm spray quality
- Bare ground apps; Release height: 3m (UAV), 0.5m (ground)
- UAV spray pattern was measured for the UAV, release height, nozzle, forward speed, and environmental conditions

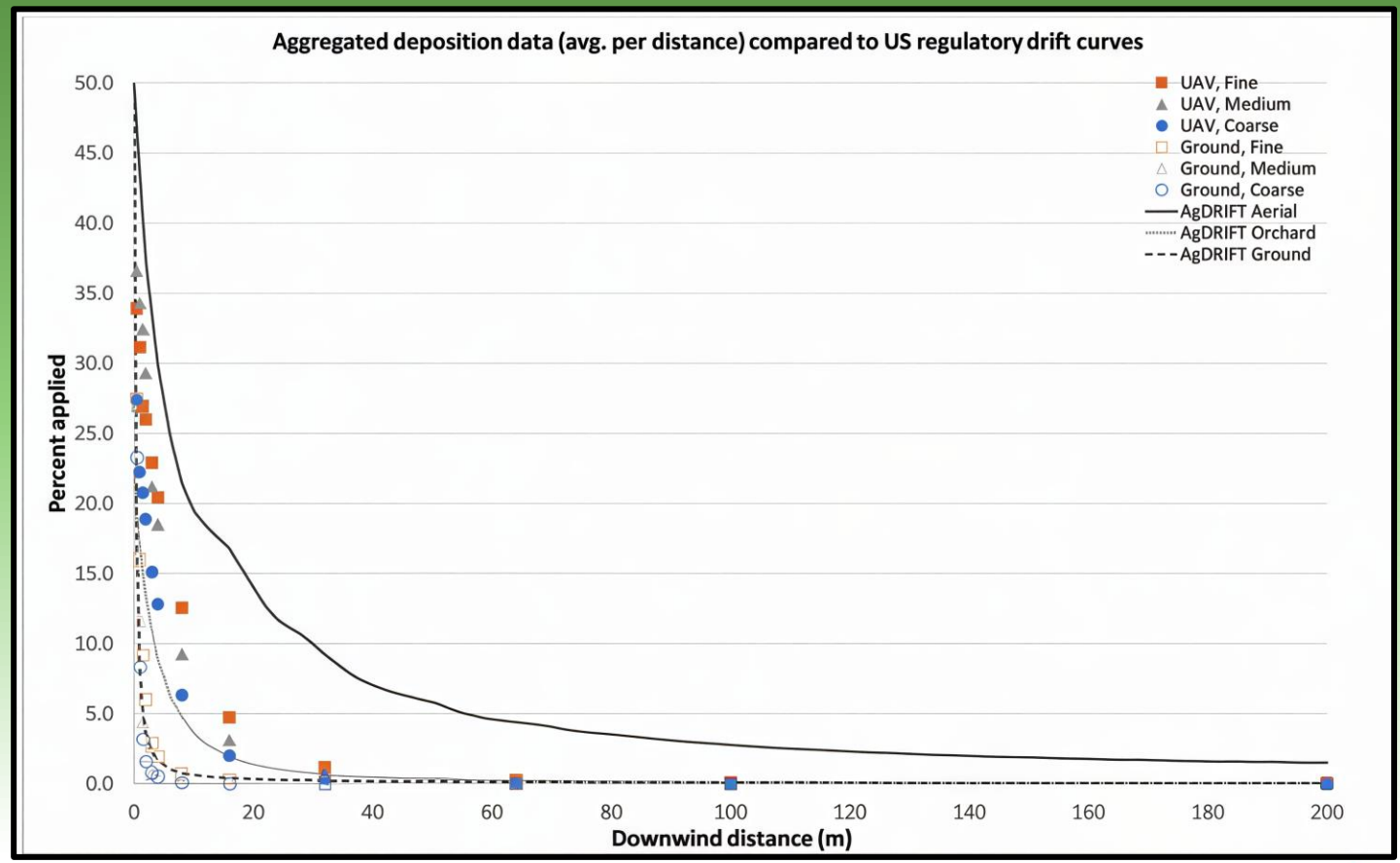
Location	Timing
USA (non GLP) (Robstown, Texas)	February 2023
Canada (GLP) (Saint-Jean-Sur-Richelieu, Quebec)	May 2023
Brazil #1 (GLP) (Santa Helena de Goiás, Goiás)	September 2023
Hungary (GLP) (Bugac)	October 2023
Spain (GLP) (Oropesa)	November 2023
USA (GLP) (Robstown, Texas)	December 2023
Brazil #2 (GLP) (Castro, Parana)	March 2024
Australia (GLP) (Clifton, Queensland)	April 2024
South Africa #1 (GLP) (Delmas, Mpumalanga)	September 2024
South Africa #2 (GLP) Hertzogville, Free State	September 2024

Downwind Deposition Data (aggregated, US drift curves)

- US Regulatory Drift Curves
  - Tier 1 Aerial, Fine-Medium Droplets
  - Tier 1 Orchard Airblast
  - Tier 1 Ground, 50th percentile, low boom, fine-medium coarse

- UASS Deposition Results
  - Follow expected trend by droplet size
  - 90% ground deposition within 16 m
    - 99% ground deposition observed by 32 m
  - **UASS data fall between regulatory drift curves for ground and aerial applications**

- Data Submission Timeline
  - 2023 Data: April-July 2025: US EPA, CAN PMRA, APVMA, UK CRD
  - 2024 Data: Q4 2025 Submission
  - Incorporate Data into OECD WPP Drone Subgroup Update Reports



The UAPASTF is pleased to announce the first-ever data submissions of Good Laboratory Practices (GLP) spray drift field trials using unmanned aerial spray systems (UASS) to:

- The U.S. Environmental Protection Agency (EPA)
- Health Canada's Pesticide Management Regulatory Agency (PMRA)
- Australia's Australian Pesticides and Veterinary Medicines Authority (APVMA)
- The United Kingdom's Health and Safety Executive (HSE) Chemicals Regulation Division (CRD)

Public Announcement from the Unmanned Aerial Pesticide Application System Task Force, LLC (UAPASTF)

July 28, 2025

Global Pesticide Industry Drone Task Force Submits First GLP UASS Drift Studies to the U.S. EPA, Canadian PMRA, Australian APVMA, and United Kingdom HSE CRD

The global Unmanned Aerial Pesticide Application System Task Force, L.L.C. (UAPASTF) is pleased to announce the first-ever data submissions of Good Laboratory Practices (GLP) spray drift field trials using unmanned aerial spray systems (UASS) to the U.S. Environmental Protection Agency (EPA), Health Canada's Pesticide Management Regulatory Agency (PMRA), Australia's Australian Pesticides and Veterinary Medicines Authority (APVMA), and the United Kingdom's Health and Safety Executive (HSE) Chemicals Regulation Division (CRD). UAPASTF's 2025 submissions represent an important milestone for the industry-wide Task Force, which was formed in December 2021 by pesticide manufacturing companies that are jointly developing data to support the use of UASS for pesticide applications globally. UAPASTF anticipates continued engagement with additional regulatory agencies and stakeholder groups over the coming months. Additional data submissions are expected since this first submission represents just one year of studies (2023). Additional work of the UAPASTF is focused on developing best practice guidance (here and here), providing guidance for spray drift trials (here), and informing estimates for non-dietary (i.e. occupational) exposure.

Emerging technologies such as UASS are being adopted at a rapid pace in agricultural and other pesticide applications worldwide. The data required to effectively regulate the use of UASS must be gathered to position these relative to other conventional pesticide application technologies in agriculture. UASS must be integrated into regulatory processes as an additional option for pesticide applicators, enabling the technology to meet its full potential and deliver precision agriculture, targeted pesticide application, and sustainability goals while protecting human health and the environment.

The UAPASTF's mission is to share resources in the design, evaluation, and development of proprietary data for use in exposure estimates, regulatory drift models, risk assessments, and regulatory decisions. The UAPASTF was formed in part to respond to the recommendations of the Organisation for Economic Co-operation and Development (OECD) Working Party on Pesticides (WPP) Drone/Unmanned Aerial Spray Systems Subgroup (ODSG). Because the guidance of the ODSG is critical internationally, alignment with its work is important to achieving the UAPASTF's goals, which include:

1) Characterizing off-site movement and spray drift potential of UASS-based applications alongside established conventional application methods (i.e., aerial or ground sprayers);
2) Evaluating occupational and residential exposures from use of UASS for pesticide applications; and
3) Characterizing crop residues from UASS-based applications alongside conventional methods.

Public Announcement from the Unmanned Aerial Pesticide Application System Task Force, LLC (UAPASTF)

July 28, 2025

The UAPASTF's work product is proprietary to its members, and the UAPASTF retains all rights in the data. In the future, when UAPASTF studies are relied upon by applicants or registrants to satisfy pesticide regulatory requirements of any nation's regulatory authority to which the Task Force has submitted data, they must either be members of the UAPASTF or offer to pay compensation to the UAPASTF for their reliance upon the Task Force's data as provided under applicable law.

The UAPASTF welcomes new members to join the Task Force, given the importance and significance of the work it is doing to enhance the options for administering pesticides in a safe and efficient manner. Any pesticide applicant or registrant who desires to add UASS application methods to their own product labels is welcome to join the Task Force's efforts. The member companies of UAPASTF will have the right on a worldwide basis to rely upon Task Force data for purposes of registering pesticides, maintaining and defending pesticide registrations, and protecting exclusive use and data compensation rights.

If a non-member applicant or registrant wishes to seek approval to add UASS application methods to any product label, it may (a) join the UAPASTF; (b) cite to the UAPASTF's work and pay compensation to the UAPASTF for reliance on such data in accordance with FIFRA sections 3(c)(1)(F) and 3(c)(2)(B) and the analogous provisions of other nation's rules and regulations; or (c) submit its own information that is of sufficient quality to meet regulatory requirements.

Applicants and registrants should be aware that UAPASTF is developing its study program as an integrated whole. Any decision to simply cite the Task Force's data and offer to pay compensation must extend to all related studies. In accordance with FIFRA and where applicable other nations' rules and regulations, in the event that the UAPASTF and a non-member who cites to the UAPASTF's work are unable to reach a cost-sharing agreement, the terms and amounts of compensation shall be determined by arbitration, as provided, for example in the United States, in sections 3(c)(1)(F) and 3(c)(2)(B) of FIFRA.

Those desiring more information about the UAPASTF, including membership terms, may visit the UAPASTF website (https://uapastf.com/) or contact:

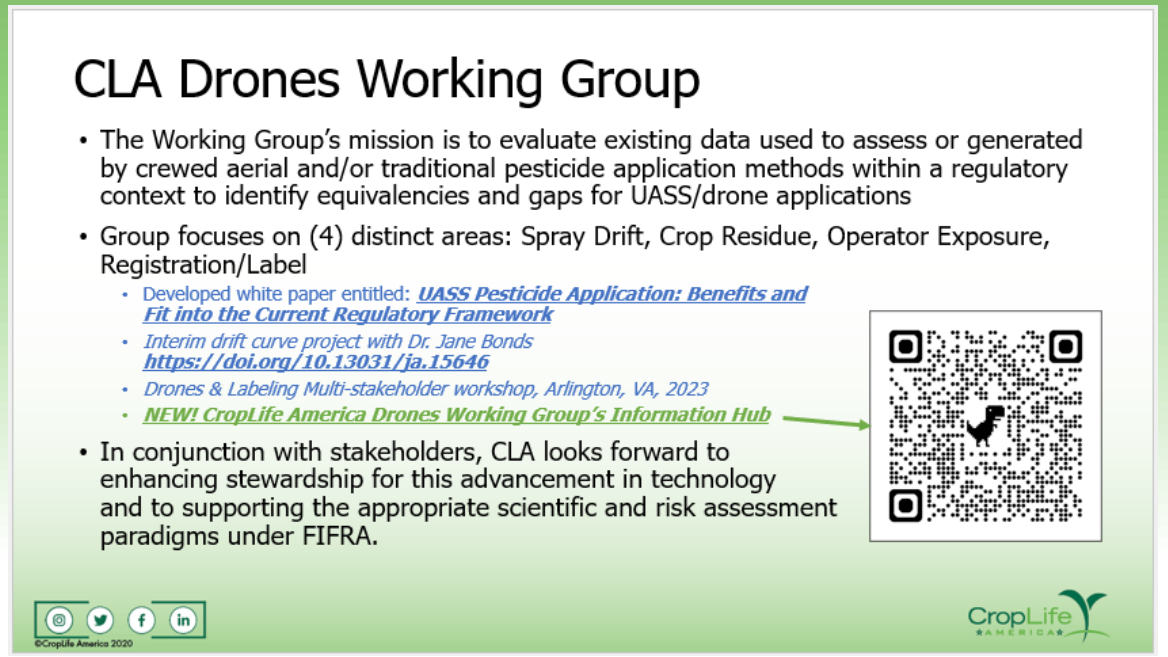
Alan Sachs and Harold Himmelman, UAPASTF Counsel
Beveridge & Diamond, P.C. (202) 789-6049

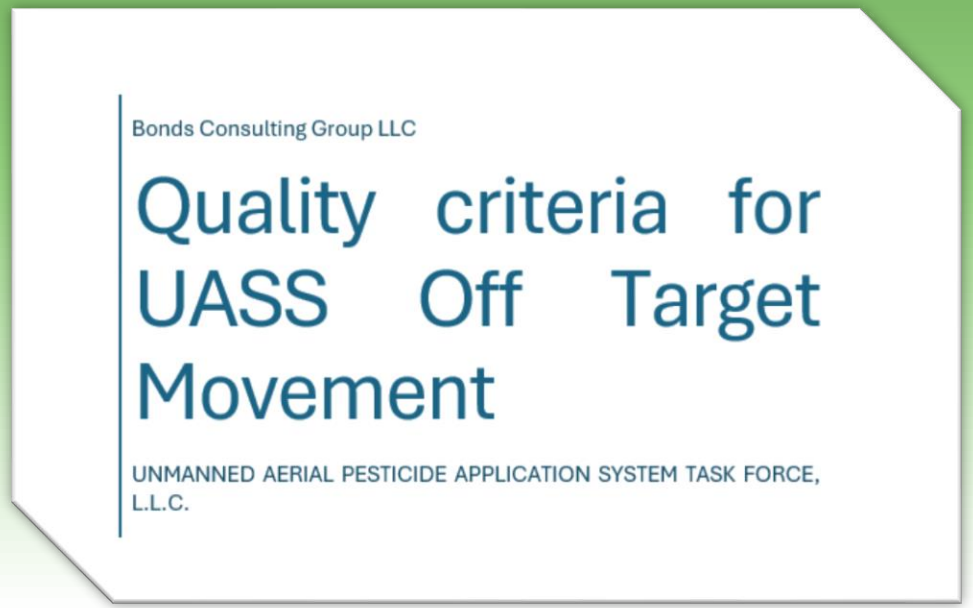
Travis Bui, Chair of the UAPASTF Administrative Committee
Corteva Agriscience (317) 431-7892

Rhonda Bichsel, UAPASTF Administrative Manager
(660) 621-4237

Environmental and Ecological Exposure Sub-team

- The first activity was to update the off-site movement database developed for the CLA Drones Working Group (DWG)
- The second activity was to develop/refine the quality criteria for UASS off-target movement studies to have reliable exposure estimates and be suitable for use in model validation





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Non-Dietary Exposure - Survey

- **GOAL 1**: collect qualitative information on job step distribution for operators (mixer/loader/applicator)
  - A data gathering exercise for job-step or operational practices, including mixing and loading scenarios, would help to both better understand the potential exposure pathways and develop or adapt existing exposure scenarios in order to make them more representative of working practices with drones.

- **GOAL 2**: collect quantitative information on job steps and applications
  - It may be possible to use established exposure models and approaches to predict the levels of operator exposure resulting from the use of drones.
  - The most relevant quantitative information related to the parameters that drive the current risk assessment should be collected
    - Formulations handled
    - Acres treated per Day
    - Gallons sprayed per Acre
    - Equipment and techniques used to mix, load, clean, etc.

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Residue Data for UAV Crop Applications

- **Are crop residues from UAV applications equivalent when compared to conventional applications?**
  - A multidisciplinary working group (WG) was formed
  - A side-by-side GLP comparative study of chemical residues levels from drone and conventional (ground) applications:
    - Multiple UAV platforms
    - 4 crop types (large field, small field, orchard & trellis)
    - Increased application rates above labeled rates and reduced PHI to ensure quantifiable residues
    - PMC conducted field trials at 7 locations in Canada

Working Group Membership	
AAFC – Strategic Policy Branch	Bayer
AAFC – Pest Management Center	Syngenta
HC – Pest Management Regulatory Agency	Strongfield Environmental Solutions
Transport Canada	Precision AI
TBS – Center for Regulatory Innovation	Protein Industries Canada
OMAFRA	Aerial Evolution Canada

- **Initial results show that residues from drone application are equivalent (or no worse) than boom applications.**
  - Residues for side-by-side drone applications were not statistically different.

Agriculture & Agri-Food Canada

- Martin Trudeau, AAFC
- Jessica Stoeckli, AAFC

Agriculture and Agri-Food Canada

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UAPASTF BMP Considerations

- Pesticide application requires expertise and stewardship—especially with new technologies
- BMPs increase the likelihood of good environmental and occupational practices
- Not our intention to make this a standard (for example ASAE) but the UAPASTF BMPs could be utilized in works towards standards
- Can be used as guide to expand on local BMPs
- The registered and current product label should ultimately be followed above any other source of information
- Input sought and received from key external experts including: academics, government entities, OECD & CropLife, application specialists and drone manufacturers
- This document is not endorsed or approved by any other organization besides the UAPASTF

Unmanned Aerial Spray Systems (UASS):

Start Here for Best Practice Resources

UAPASTF

Drone Pesticide Application is Unique and Growing in Popularity

- Changes in UASS technology and regulations are happening rapidly.
- UASS has broad global appeal, with uptake examples in all four regions of the world.
- Regulatory frameworks and best practices are available and will differ based on the local situation.

Best Management Practices (BMPs) and UASS

- Pesticide application requires expertise and stewardship for proper use and safe handling, especially with a new technology like UASS.
- BMPs increase the likelihood of good environmental and operator practices while considering economic factors, availability, technical feasibility, and effectiveness.
- The BMPs provided here are intended to supplement information on the local product label. The registered and current product label should ultimately be followed above any other source of information. Readers should therefore ensure that this guidance is adapted or supplemented by other country/state/region specific needs, conditions, laws, and regulations, as relevant, including official and required aviation training, to ensure safe operations, which may not be explicitly mentioned on pesticide labels.

Purpose and Scope

- This BMP document intends to provide general guidance on best practices for the safe and effective application of pesticides when using UASS primarily for agriculture. The following areas are discussed:
  - **Current licensing regulations in key UASS markets**
  - **User safety in the context of pesticide handling**
  - **Equipment set up and calibration parameters that impact spray deposition while reducing off target movement (drift), including impact of equipment selection and environmental conditions**
- Because changes in UASS technology and regulations are happening rapidly, this document is intended to be updated regularly to ensuring the guidance and references within stay relevant.

While this is an exciting space, it should also be noted that in many geographies, UASS represent a complementary application technique to existing methods, and further understanding of their unique value and best local practices will help position their use appropriately and more effectively.

The Unmanned Aerial Pesticide Application System Task Force (UAPASTF) consists of the pesticide member companies: BASF Corporation, Bayer CropScience LP, Corteva Agriscience LLC., FMC Corporation, Gowan Company LLC, Nufarm Americas, Inc., Syngenta Crop Protection LLC, and Valent U.S.A. LLC. The UAPASTF, convened by industry, generates, submits, and/or shares/provides access to information and data to governmental agencies to address limitations in available regulatory information and to support risk assessment.

https://uapastf.com/

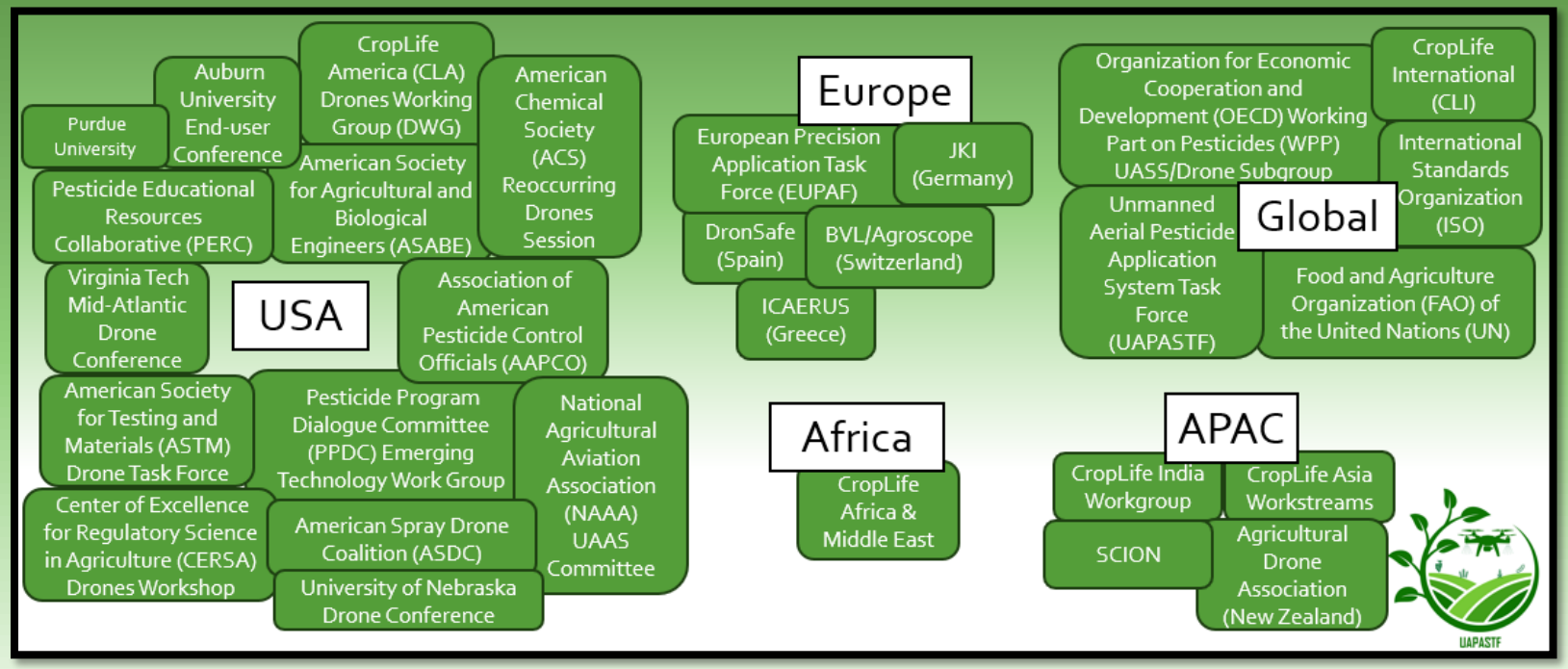
UAPASTF making progress toward stated goals

- **'Recommendations for conducting UAV off-site movement studies' released** (uapastf.com)
- **Nine GLP off-site movement studies in 7 countries on 5 continents**
  - Data analysis from UAPASTF field study program / database ongoing
  - ***Data fall between regulatory drift curves for ground and aerial applications***
- **Best Management Practices for Safe and Effective Application of Pesticides Using Unmanned Aerial Spray Systems (UASS) [Version 1.0]**
- **Work on nondietary / occupational exposure has been initiated**
  - UAPASTF & UK CRD collaboration

- **Field crop residue program (with input from PMRA & UAPASTF on study protocol) implemented by Ag and AgriFood Canada & PMC**
  - Preliminary review of results demonstrate equivalency of ground & UAV applications

Next Steps

- **Regulatory Submissions**
  - 2024 Field Trial Data – Q4 2025
  - Environmental and Ecological Summary Report
- **Building an off-site movement database**
  - Looking for tripartite opportunities to develop empirical / mechanistic exposure models for regulatory exposure / risk assessment
- **Initiate Non-Dietary Exposure Survey**
- **Potential Additional Regulatory Considerations**
  - UAV Platforms
  - Nozzle parameters
  - Labeling



And…Continued Connection & Collaboration with Working Groups

OECD WPP, EUPAF, CropLife orgs, etc.

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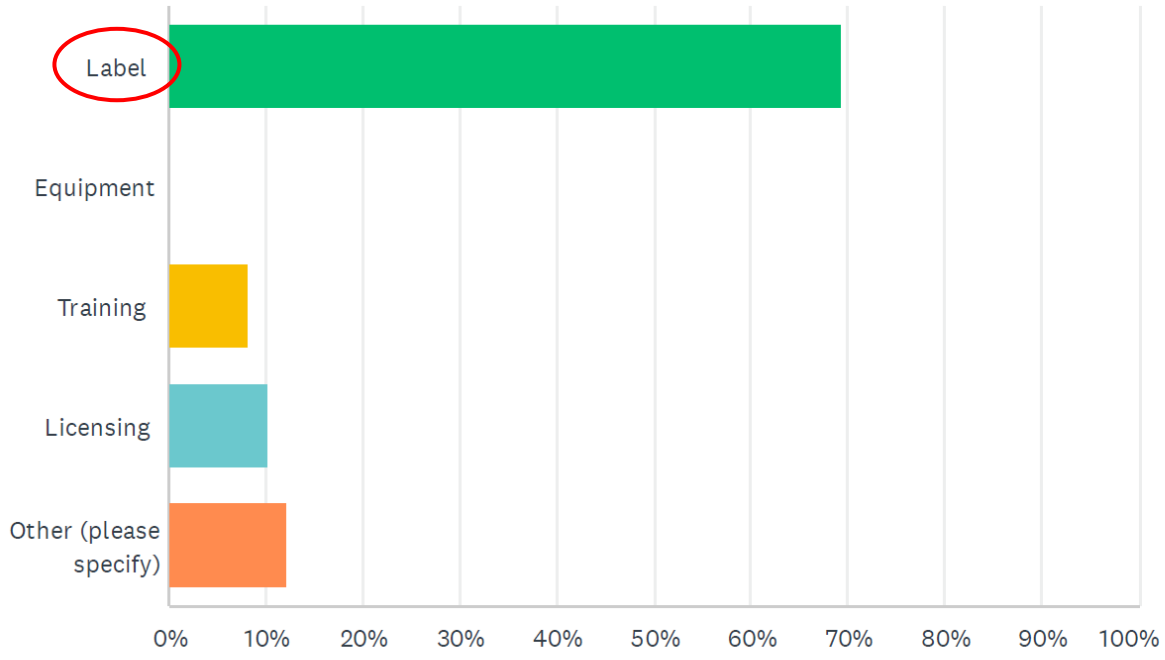
2024 AAPCO Technology Workgroup Survey

Q21 What does your agency see as the single biggest regulatory issue with UAV pesticide applications (Select one).

Answered: 49 Skipped: 1



https://aapco.org/2015/07/01/technology-workgroup/

UAPASTF

CropLife America Drones Working Group

- The Working Group's mission is to evaluate existing data from crewed aerial and/or traditional pesticide application methods within a regulatory context to identify equivalencies and gaps for UASS/drone applications
- Group focuses on (4) distinct areas: Spray Drift, Crop Residue, Operator Exposure, Registration/Label
  - Developed white paper entitled: ***UASS Pesticide Application: Benefits and Fit into the Current Regulatory Framework***
  - *Interim drift curve project with Dr. Jane Bonds* ***https://doi.org/10.13031/ja.15646***
  - *Drones & Labeling Multi-stakeholder workshop, Arlington, VA, 2023*
  - ***NEW! CropLife America Drones Working Group's Information Hub***
  - ***Coming soon…Drones & Labeling Multi-stakeholder workshop***
- In conjunction with stakeholders, CLA looks forward to enhancing stewardship for this advancement in technology and to supporting the appropriate scientific and risk assessment paradigms under FIFRA.

https://www.croplifeamerica.org/croplife-america-drones-working-group-information-hub

Co-Chairs:

Sarah Hovinga, Bayer

Rebecca Willis, BASF

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Drones / Uncrewed Aerial Spray Systems (UASS)

The **Drone/UASS Subgroup** (Lead UK) oversees a programme of work to set out a framework that will enable regulatory authorities to assess the risks associated with applying pesticides using drone technology, and to provide guidance to an industry Task Force and other Unmanned Aerial Vehicle (UAV) groups, as appropriate, on addressing the recommendations to fill data gaps included in the 2021 ***OECD Report on the State of the Knowledge – Literature Review on Unmanned Aerial Spray Systems in Agriculture***. See the work of the Drone/UASS Subgroup "In Focus" below.

IN FOCUS: SUPPORTING THE ASSESSMENT OF RISKS ASSOCIATED WITH DRONE / UNCREWED AERIAL SPRAY SYSTEMS APPLICATIONS OF PESTICIDES

To allow **a focused and more harmonised international approach to deliver potential efficiencies for governments and industries**, it is important that the regulatory, industry, research and other communities be aware of the recent and on-going efforts which are contributing to the developing evidence base to support the assessment of risks associated with Uncrewed Aerial Spray Systems (UASS)[1] applications of pesticides.

The **OECD Drones/UASS Subgroup (OECD Drone Subgroup)** is providing advice to a Task Force convened by industry (Unmanned Aerial Pesticide Application System Task Force [UAPASTF]), and other relevant groups, to address limitations in available regulatory information and to support risk assessment in relevant governmental agencies, as recommended in the 2021 ***OECD Report on the State of the Knowledge Literature - Review on Unmanned Aerial Spray Systems in Agriculture***[2]. Though the information, databases and models being generated by the UAPASTF and other relevant entities will not be OECD products, work undertaken by the UAPASTF is being conducted under specific guiding principles, processes, and criteria[3] endorsed by the Working Party on Pesticides, and the OECD Subgroup intends to release, **in 2025 and/or 2026, a Summary Report(s) of its compiled references and views on data, information and tools being generated**.

The OECD Drone Subgroup is preparing to review, in 2025/2026, UAPASTF developed **empirical spray drift curves** to help estimate off-target exposure from drone applications, informed by the UAPASTF **database of spray drift and deposition empirical data for regression analysis**. The database contains (1) "mined" data from peer-reviewed publications, (2) potentially new data from research activities of other registrants and researchers, and (3) is being supplemented with data resulting from a significant UAPASTF GLP field-testing programme of off-site movement of pesticides applied by drones performed in seven countries on five continents in 2023 and 2024 according to a predefined protocol. The UAPASTF is currently submitting full study reports to specific national regulatory agencies as part of the pesticide product registration process.

The Drone Subgroup has provided feedback to the UAPASTF on **recommendations for conducting unmanned aerial vehicle (UAV) field drift trials** and on UAPASTF **guidance for the safe and effective application of pesticides using UASS** and is providing advice on work to refine the understanding of the **influence of drone design on the risk of pesticides applied** using the technology and on **exposures that result from handling and filling operations**. It is staying informed of activities to improve the spraying systems of drones to provide an appropriate application quality and to minimise environmental risks.

The Drone Subgroup is also staying informed of initiatives to develop a **mechanistic model for predicting spray deposition and drift**. The development of a useable publicly available mechanistic model for use by regulatory agencies for the assessment of risks from drone spray drift is a longer-term objective of the Drone Subgroup.

The United Kingdom is leading this project. For more information contact Jane RICHARDSON and Sally DE MARCELLUS.

[1] UAV, unmanned aerial vehicle, refers to the "drone" aircraft. UASS, uncrewed aerial spray system, is used to indicate a drone with a spray system. UASS is used to be consistent with the International Organization for Standardization (ISO) technical committee using "UASS". However, the ISO uses "Unmanned Aerial Spray System" and the OECD Drone/UASS Subgroup chose in 2022 to use "Uncrewed Aerial Spray System".

[2] OECD (2021), Report on the State of the Knowledge – Literature Review on Unmanned Aerial Spray Systems in Agriculture, Series on Pesticides and Biocides, OECD Publishing, Paris, https://doi.org/10.1787/9240f8eb-en .

[3] Guiding principles, processes, and criteria for the work of the OECD Drone/UASS Subgroup of the Working Party on Pesticides [ENV/CBC/WRPR(2024)8/FINAL].

UAPASTF alignment with the work of the OECD WPP Drone/UASS Subgroup critical to success

https://www.oecd.org/content/dam/oecd/en/topics/policy-issues/chemical-safety-and-biosafety/progress-report-june-2025.pdf

UAPASTF

Thank you!

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AgScienceMom

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