# Industry Efforts to Support UAV-based Pesticide Applications: Overview of the Unmanned Aerial Pesticide Application Systems Task Force (UAPASTF)


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Administrative Chair, UAPASTF
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# Unmanned Aerial Pesticide Application System Task Force Established 2021

- **UAPASTF formed in response to the OECD WPP Drone/UASS Subgroup recommendations—State of the Knowledge Report (2021)**
- **Based in the US - but global in its work / focus**
- **UAPASTF global core mission: supply UAV-based regulatory data to be used in conducting human and environmental risk assessments to support UAV regulatory approvals**

| | |
|---|---|
| GLP Drift Trials & Models | Worker Exposure |
| Crop Residue | Best Practices |

- **UAPASTF interacts with OECD Drone/UASS Subgroup of WPP, regulatory agencies, CropLife, EUPAF & other stakeholders to develop & provide information / data**
  - **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)**

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| *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 Intl | **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 Nicholas | Jo Davies |
| Valent U.S.A. LLC | Leslie Garcia | Frank Carey |
| *Task force managers* | *Rhonda Bichsel* | *Eric Bruce* |

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www.UAPASTF.com

# Global Regulatory Data Needs – "State of the Knowledge"

## Environmental Exposure & Risk Assessments

- Understand Spray Drift/Off-site Movement
- Development of Empirical and Mechanistic Models

## Operator Exposure

- Qualitative "Job Steps" Survey
- Evaluation of Current NDE Models


## Best Practices

- Pesticide application requires expertise and stewardship—especially with new technologies
- September 2024 – v1.0 Released

## Crop Residue

- Are crop residues from UAV applications equivalent when compared to conventional applications?
- Connection to Agriculture and AgriFood Canada Residue Program

Agriculture & Agri-Food Canada
❖ Martin Trudeau, AAFC
❖ Jessica Stoeckli, AAFC
Agriculture and Agri-Food Canada

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# Field Drift Studies – Data Generation Plan


| 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 |

**Globally focused Good Laboratory Practice (GLP) program**

- Repeatable experiment to compare drift behavior across locations
- Single 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—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, speed, and environmental conditions
- **Based on "Recommendations for Conducting UAV Field Drift Trials – Proposed Field Study Protocol Guidance", available at https://uapastf.com**

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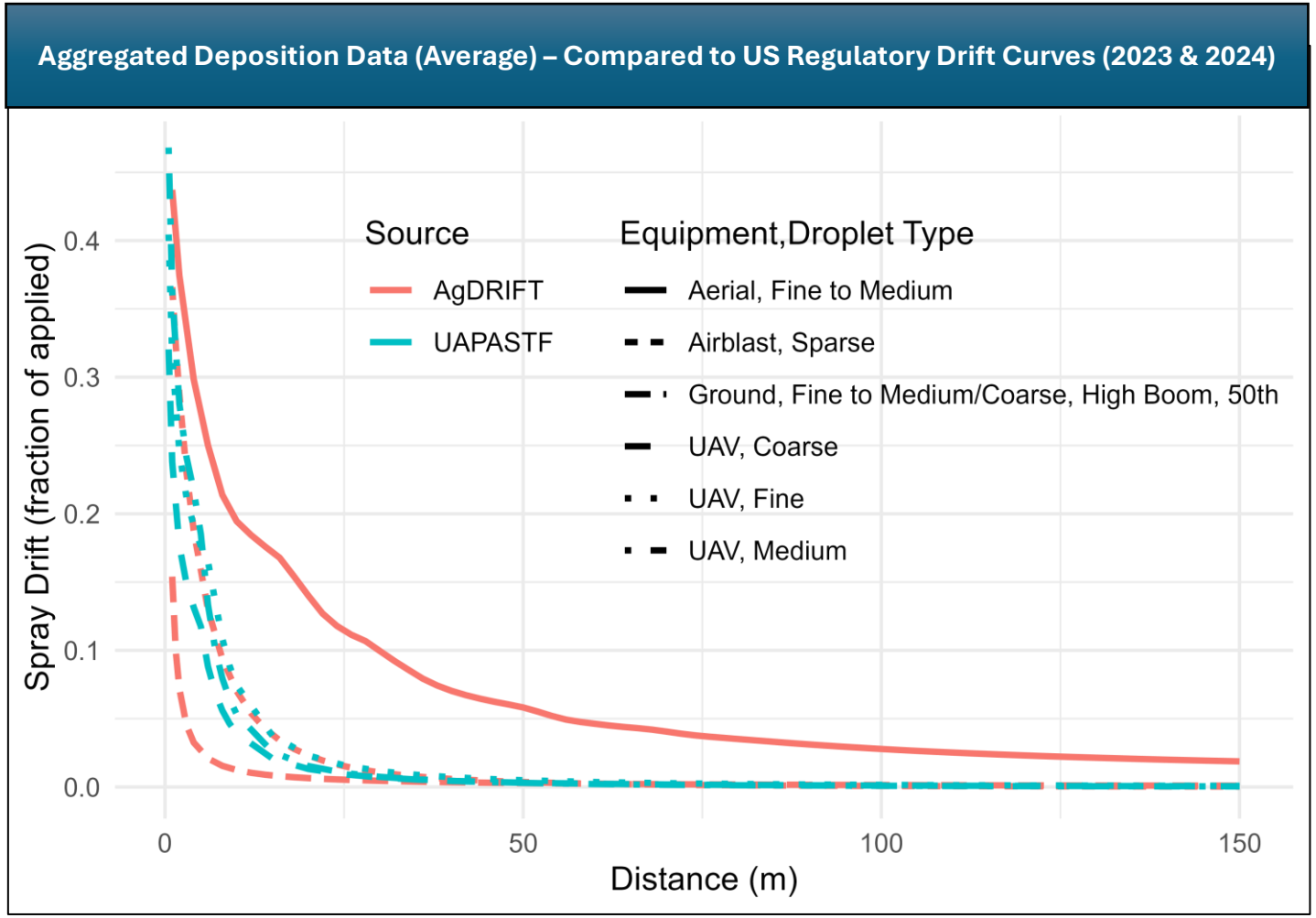
# UAPASTF Spray Drift Trials – 2023 & 2024

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

- **Data Submission Timeline**
  - **2023 Data**: Submitted to UK CRD, APVMA, US EPA, CAN PMRA
  - **2024 Data**: Planned Feb 2026
  - Includes Non-GLP Summary Drift Analysis

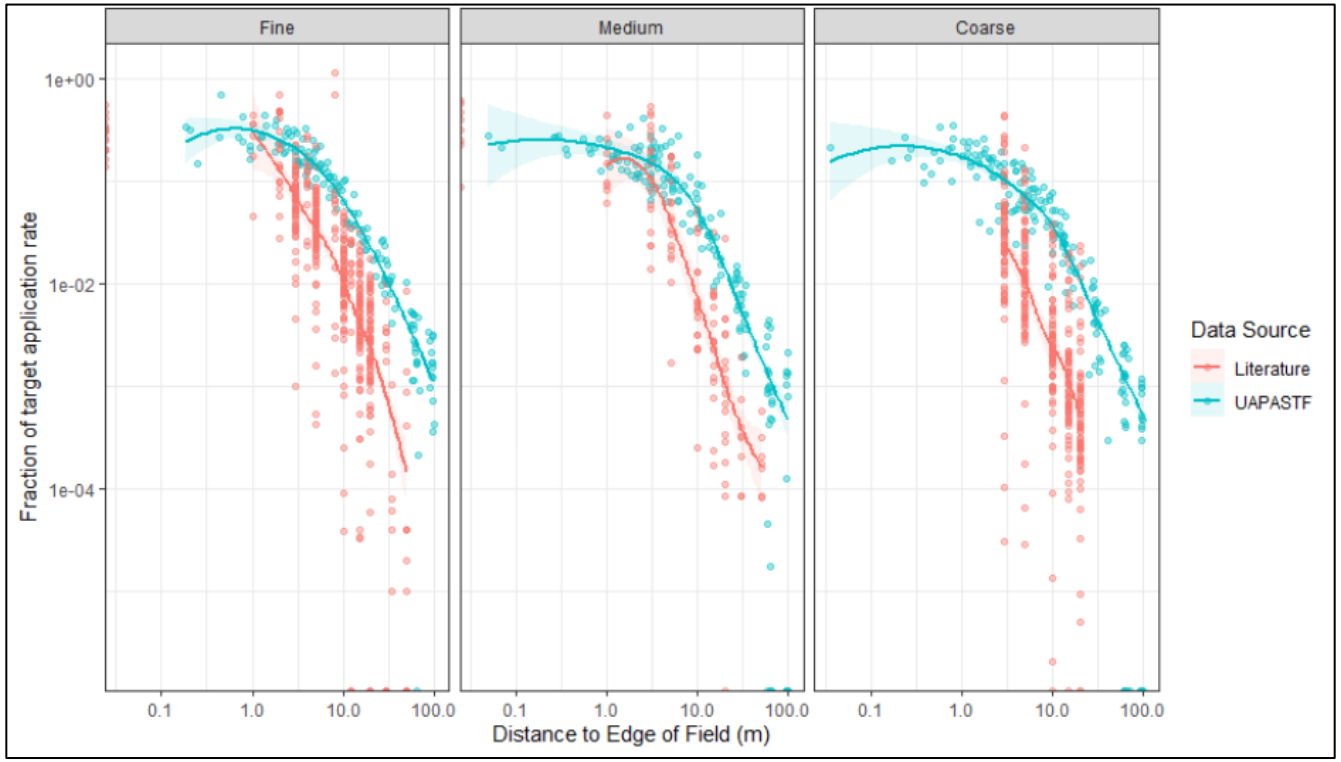
- **Modeling**
  - **Empirical Curves** using UAPASTF + Literature Database
  - **Mechanistic Models** – discussions on-going



# Comparison to Published Literature

- **Collaboration with Dr. Jane Bonds & CropLife America**
  - Database was initially built with data from publications deemed to be relevant and reliable for regulatory purposes
  - Includes 6 studies from prominent global drift researchers
  - These literature studies covered a range of UAV types, application/environmental conditions, presence / absence of crop (and crop type), and spray particle size distribution.
- **Results**
  - Deposition data is within an order of magnitude—despite substantial differences in study parameters.
  - This high-level analysis indicates the UAPASTF dataset tends to be higher than the published literature.

**Comparison of UAPASTF and Literature Deposition Data**




Bonds Publication:

# 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
  - Area treated per Day
  - Volume sprayed per unit area
  - Equipment and techniques used to mix, load, clean, etc

## Status

**March 2025 – Test Survey Conducted**

- Purpose: test various applicator exposure concepts and questions on people using unmanned aerial spraying systems in preparation for a larger global survey
- 147 Participants with 72 usable responses

**October 2025 – US Main Survey Initiated (n = 250)**

- 1-on-1 phone interviews completed
- Data analysis on-going

**Current & Future Collaboration Efforts**

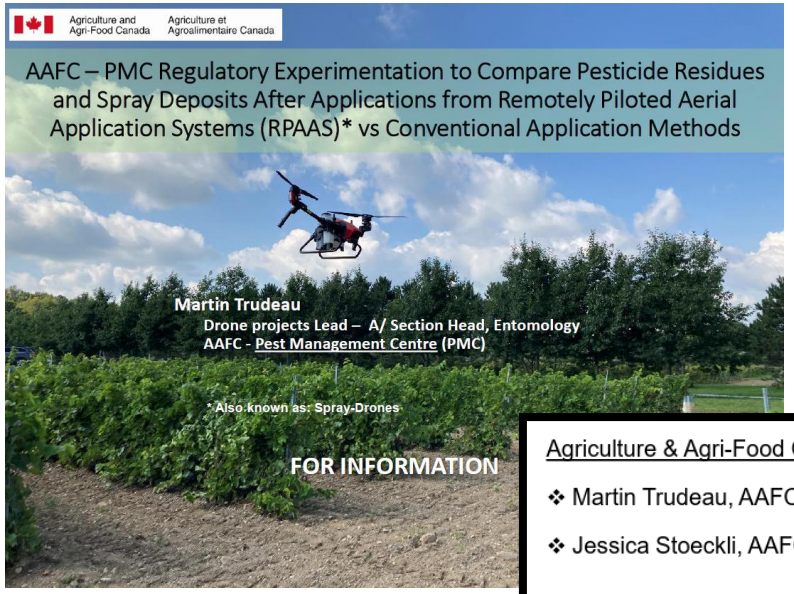
- Compare results to concurrent UK CRD survey in EU & APAC
- Submit Survey to regulators—Summer 2026
- Additional regional surveys TBD

---Internal Use---

# 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

- **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

| 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 |

---Internal Use---

# 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.

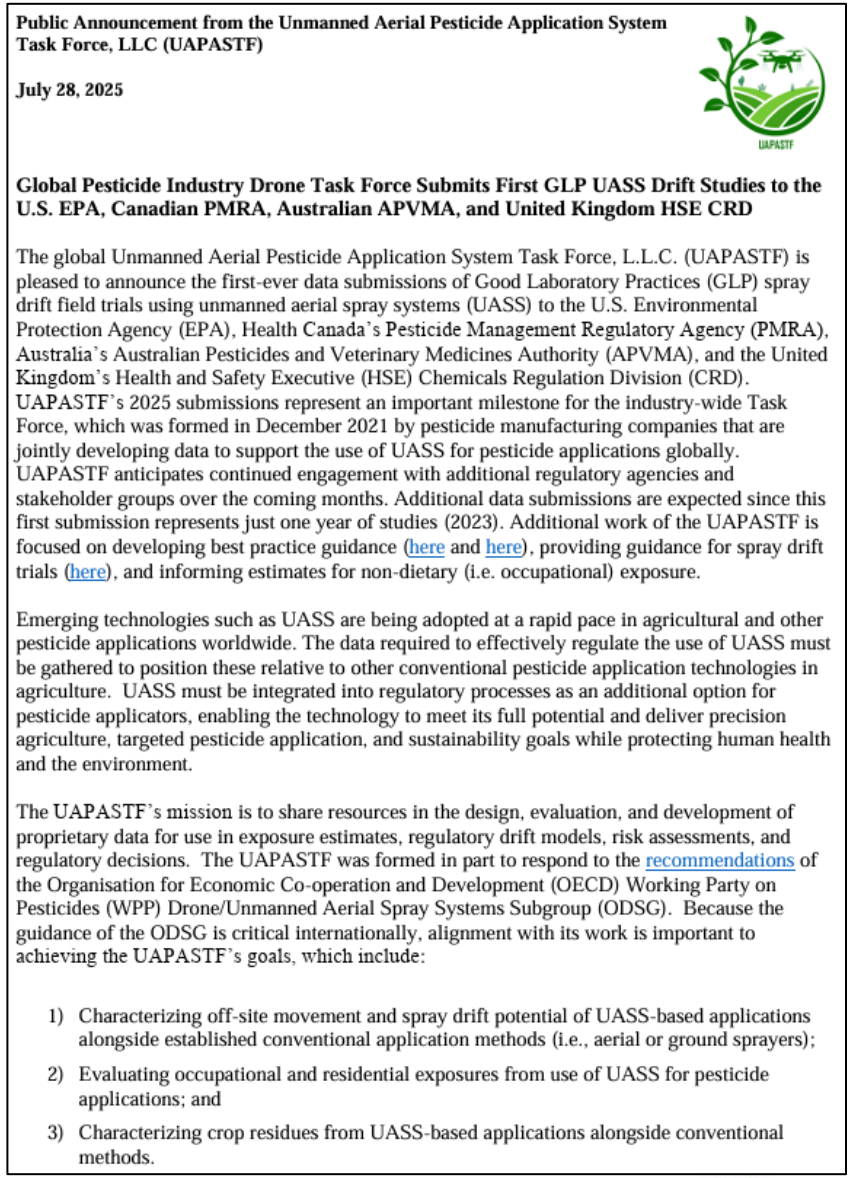
https://uapastf.com/

# UAPASTF making progress toward stated goals

- **Nine GLP off-site movement studies in 7 countries on 5 continents**
  - ‘Recommendations for conducting UAV off-site movement studies’ released (uapastf.com)
- **Data analysis from UAPASTF field study program / database ongoing**
- **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**
- **Monitoring results of AAFC/PMC Crop Residue Project**

**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)**



**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.

# Next Steps

- **Regulatory Submissions**
  - 2023 & 2024 Field Trial Data
  - EEE Summary Report
- **Building an off-site movement database**
  - Develop empirical / mechanistic exposure models
- **Non-Dietary Exposure Survey**
  - Complete data analysis
  - Develop additional surveys outside US
- **Potential Additional Regulatory Considerations**
  - UAV Platforms
  - Nozzle configurations
  - Labeling

**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

## 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/AWRPR(2024)8/FINAL].

**Special Thanks:**
Sarah Hovinga (Bayer/UAPASTF Admin Vice Chair)
Greg Watson (UAPASTF Consultant)
Frank Donaldson (BASF/UAPASTF Tech Chair)
Rajeev Sinha (Corteva/UAPASTF Tech Vice Chair)


**Thank you!**

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