Pesticide Industry Activities with Spray Application Drones

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UAPASTF Administrative Chair

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,
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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)
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	**Nestor Algarin (Treasurer)**	Jo Davies
Valent U.S.A. LLC	Robin Charlton	Christopher Read
Task force managers	*Rhonda Bichsel*	*Eric Bruce*

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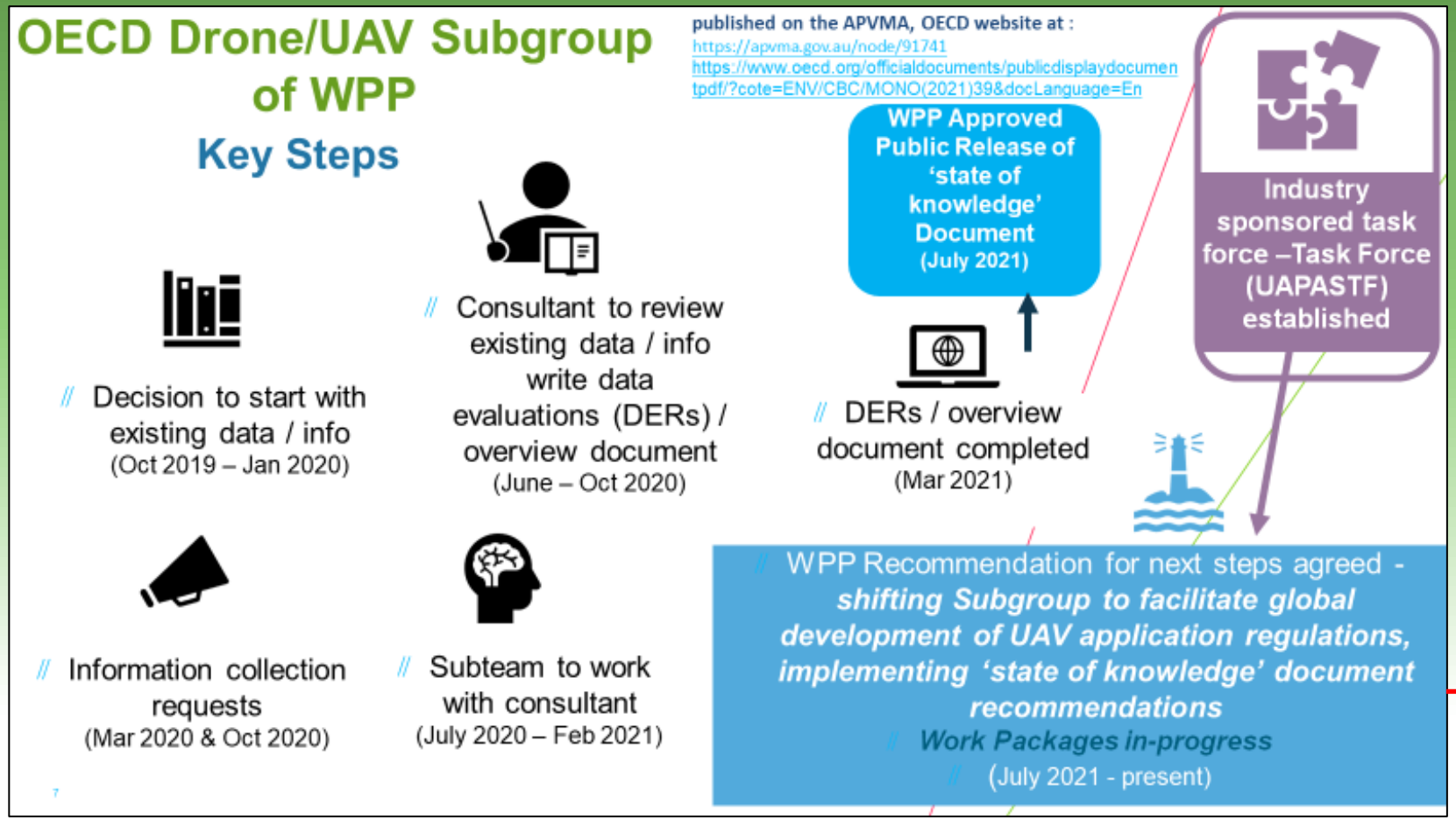
OECD WPP Drone Subgroup – est. 2019



Work Packages/Recommendations from 'State of the Knowledge' Report

Off-site Exposure (inc. modeling)
Develop empirical database and standard drift curves/model to estimate off-target exposure

Scanning / Survey to Stakeholders
Establish database to classify UAVs into groups to reduce testing requirements
Survey manufacturers/users about trends of design to inform regulatory decision-making related to worker exposure

Best Practice Guidance
Publish a user-friendly summary of best practices for application of CP products by drones

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Pesticide Evaluation Process – US EPA

- EPA evaluates **human health risks** (including sensitive groups such as children and immune-suppressed individuals), by reviewing data on:
  - Aggregate risks–through **food, water, and residential** uses
  - **Occupational risks** to those applying the product during their work

- EPA evaluates **environmental risks** by reviewing data on:
  - Contamination of surface water or ground water from leaching, runoff, and **spray drift**.
  - Risks to non-target organisms (such as wildlife, plants, fish and other aquatic organisms) as well as impacts to endangered and threatened species

- As appropriate, EPA evaluates the benefits of the use
  - EPA benefit assessments provide information on the “economic, social, and environmental” benefits of the use of a pesticide, such as improvements in agricultural production, urban and recreational land management, and public health.

- EPA makes risk management and regulatory decisions
  - Balance risks and benefits
  - Determines whether additional mitigation measures on the pesticide product label can address any risks deemed unreasonable
  - Establish new food tolerances if needed, after publishing notices for comment in the Federal Register.
  - Grant registration including, as appropriate, measures necessary to mitigate unreasonable risk.

https://www.epa.gov/pesticide-registration/about-pesticide-registration

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Crop Residue

Survey

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Drift Trials Models

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Registered Labels

https://www.epa.gov/pesticide-registration/about-pesticide-registration

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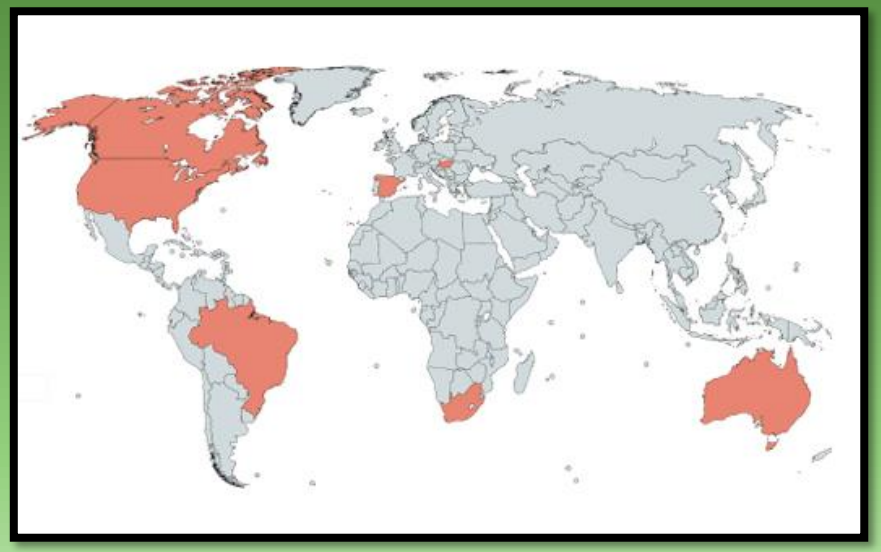
Unmanned Aerial Pesticide Application System Task Force (UAPASTF)

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

Field Drift Studies – Data Generation Plan



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)
- 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

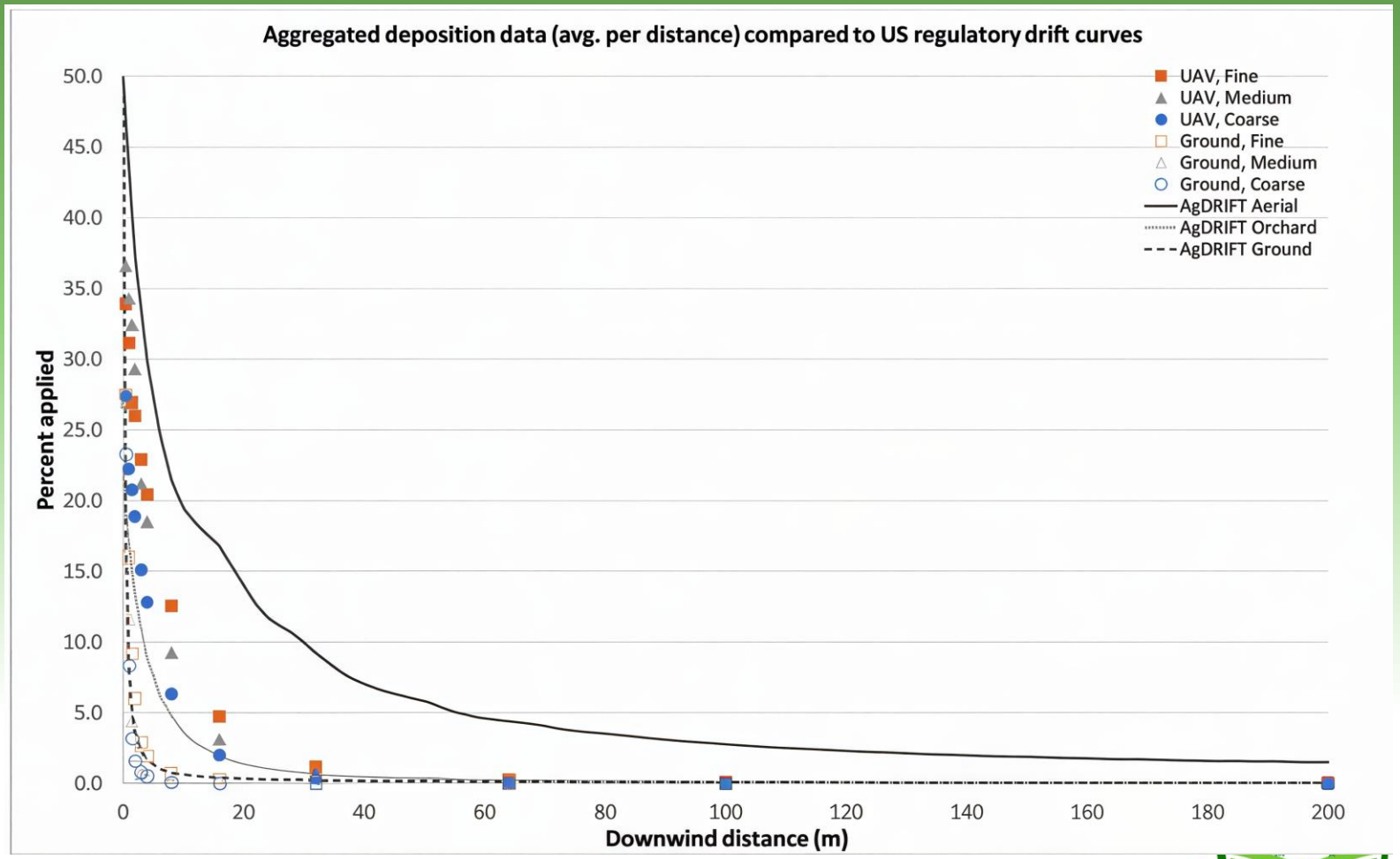
Location	Timing
USA (non GLP) (Robstown, Texas)	February 2023
Canada (GLP) (Saint-Jean-Sur-Richelieu, Quebec)	May 2023
Brazil #1 (GLP) (Santa Helena de Goiás, Goiás)	September 2023
Hungary (GLP) (Bugac)	October 2023
Spain (GLP) (Oropesa)	November 2023
USA (GLP) (Robstown, Texas)	December 2023
Brazil #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
  - Tier 1 Orchard Airblast
  - Tier 1 Ground, 50th percentile, low boom, fine-medium coarse

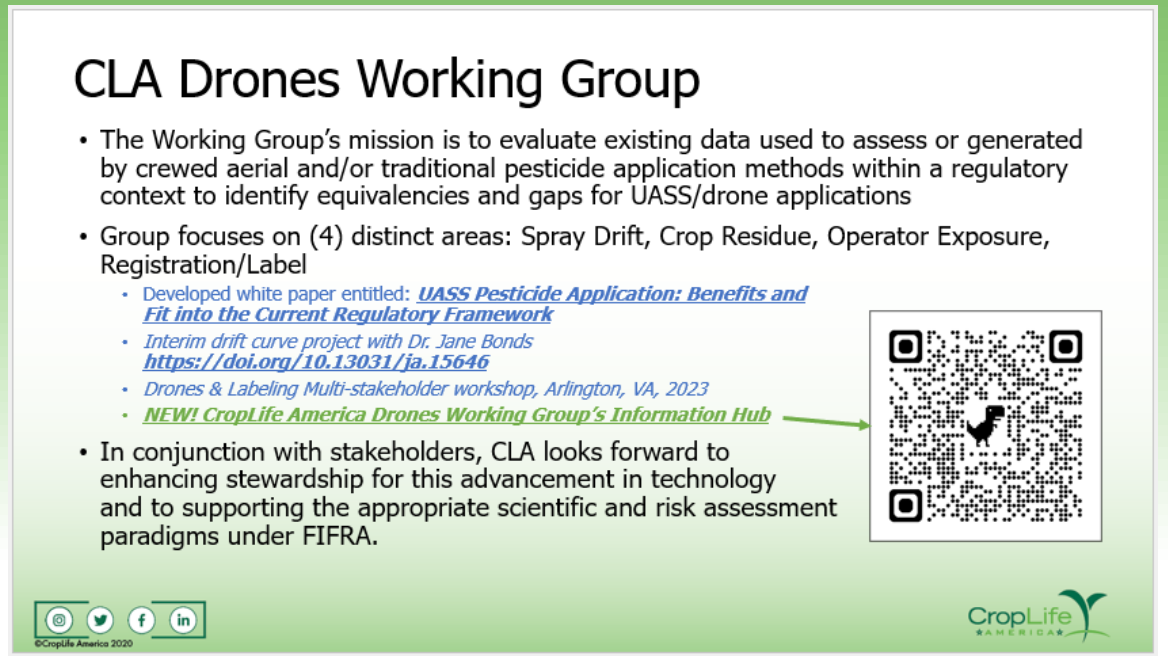
- UASS deposition results
  - Follow expected trend by droplet size
  - 90% ground deposition within 16 m
    - 99% ground deposition observed by 32 m
  - Data fall between regulatory drift curves for ground and aerial applications

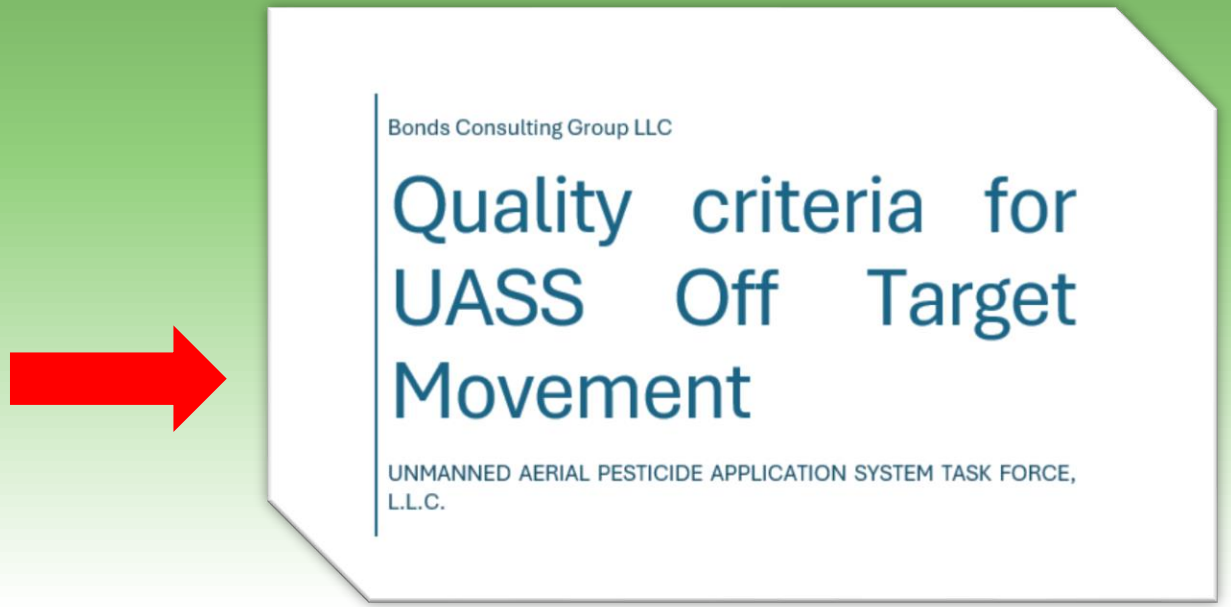
- Data Submission Timeline
  - April 2025: US EPA, CAN PMRA, APVMA, UK CRD
  - Incorporate Data into OECD WPP Drone Subgroup Update Reports



Environmental and Ecological Exposure Sub-team

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





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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

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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/

UASS BMP Components

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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 vs. 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

- **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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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.

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**
- **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 (within 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**
  - 2023 Field Trial Data – April 2025
  - 2024 Field Trial Data – Q4 2025
  - Env 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 Global NDE Survey**
- **Additional Regulatory Considerations**
  - UAV Platforms
  - Nozzle configurations
  - Labeling
- **Connection to Global Working Groups**
  - OECD WPP, EUPAF, CropLIfe, etc

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Thank you!

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