

# Aerial Spray Operations Against Forest Defoliators

Ulaanbaatar, Mongolia  
September 4, 2003

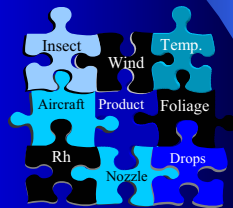
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## Introduction

- Overview of aspects of aerial application
- Improve the understanding of spray behavior
- Improve Effectiveness of Treatment
- Every project is different and must be tailored to the pest, insecticide, application equipment, and the environment

## Interaction of Spray Factors

- Aerial Application is a complex interaction of many factors.
- Understanding trade offs



## Aircraft and Spray Systems

- Planes and Helicopters
  - Various Aircraft types
- Micronairs

## Aircraft and Spray Systems



## Ag-Cat (300 ha/hr)



An-2 (400 ha/hr)



Weatherly (225 ha/hr)



Air Tractor 502B (500 ha/hr)



Turbo Thrush (500 ha/hr)



M-18 (700 ha/hr)



Hiller 12E (100 ha/hr)



**KA-26 (120 ha/hr)**



**Bell 47 Soloy (120 ha/hr)**



**Bell 206 IIB (100 ha/hr)**



**HU-1H (280 ha/hr)**



**Bell 205 (280 ha/hr)**



**Aircraft Spray System**



## Micronair AU5000



## Aircraft Preparation

- Determine Swath Width
- Calibration

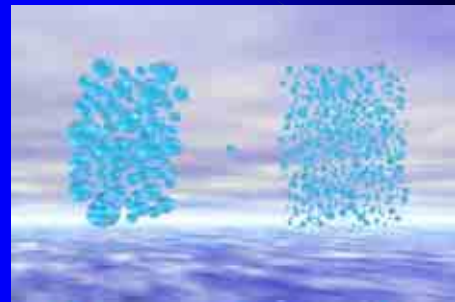
## Determine an Aircraft's Effective Swath Width

Control = Dose (IU's) + Exposure (drops)

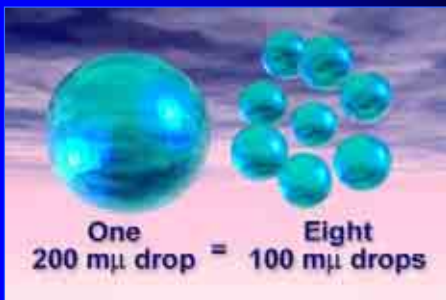
48 BIU: VMD 100 - 200 $\mu$ m and 20 drops/cm<sup>2</sup>

76 BIU: VMD 80 - 125 $\mu$ m and 20 drops/cm<sup>2</sup>

## VMD (Volume Median Diameter)



## Volume and Diameter



## Drops per Liter by Size ( $\mu$ m)



## Characterization

Determine the Swath Width

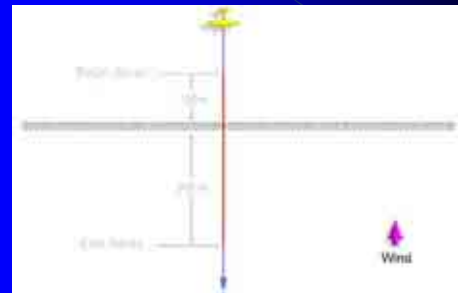
## Card Line Layout



## Card holders



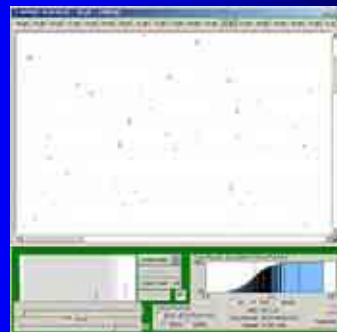
## Card Line Layout



## Deposit Patterns Analysis



## Card Measurement



## Stainalysis Software

- WWW.REMSPC.COM
- 1200 dpi scanner

## Turbo Thrush 8 AU5000s

45 meter swath width



COV = 37%

## Calibration of the Aircraft

## Calculating Flow Rate (lpm)

Swath Width x Airspeed x Application Rate

600

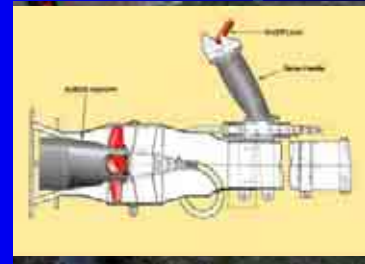
$$\text{LPM} = (40 \text{ m} \times 140 \text{ kph} \times 3 \text{ l/ha}) / 600$$

$$\text{LPM} = 28.0$$

## Calibrating the Aircraft



## Backpack Sprayer – AU8000



## Sprayer Operation



## Sprayer Calibration

- Walking Speed of Operator
  - Timed walk over terrain
- Width of Spray Swath
  - Inside of the forest
- Application Volume
  - 5 liter/hectare

## Drift

## Factors Affecting Drift (and Drop Size)

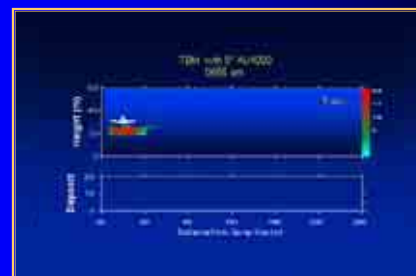
- Release Height
- Wind Speed
- Wind Direction
- Temperature
- Relative Humidity
- Nozzle Type
- Spray Pressure
- Spray Material
- Air Stability

## Weather

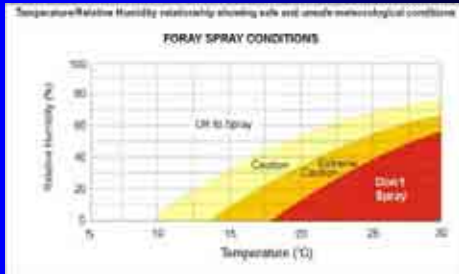
- Temperature and Rh
- Wind
- Instruments



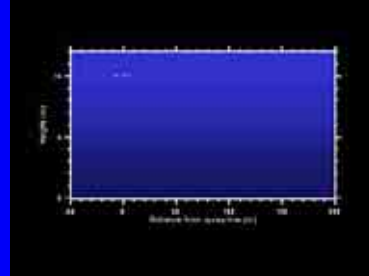
## Wind



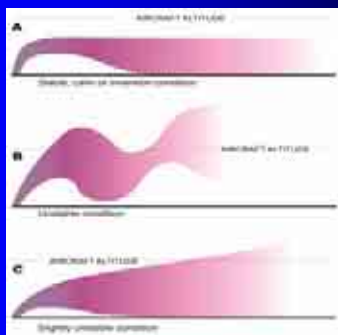
## Temperature and Rh



## Droplet Size and Transport



## Atmospheric Stability



## Operational Weather



Wind Speed  
(0.5 – 4.4 mps)



Signs



Relative Humidity (> 50%)

## Operational Weather



Morning - Humidity (75%) and  
Temperature 10° C



Afternoon - Humidity (40%) and  
Temperature 25° C

## Summary

- Recommend 100 µm size droplet for conifers
- Conduct card line before deciding lane separation (swath width)
- Weather information must be taken near treatment area and relayed to director
- Limit spray conditions to < 4.4 mps and use Foray temp/Rh chart

