How can we increase efficiency of aerial application? By Alan McCracken

The majority of agrochemical products are applied as liquid sprays, with the concept of distributing the liquid uniformly over the target area without much concern about the "specific target," be it weeds, insects or fungal disease. There is only one example from my perspective that requires the product to be distributed over the surface area and that is for herbicides to be incorporated in the soil.

Spray deposition Analysis:
A clear example of this is the current practice of using horizontal water sensitive paper cards for analysis of the droplet spectrum and subsequent computer calculations to determine the actual amount recovered. From a scientific perspective ALL product collected on horizontal collection devices [water sensitive cards or other mediums] in the base of the crop is a measure of the product LOST, resulting in contamination of the soil, except in the case of a herbicide for incorporation.

Match the droplet size to the target: Insect, fungus, crop, soil or water incorporation.
The most important step is the selection of the correct droplet size to match the product being applied to the target crop, rather than to specify volumes per acre. This concept was originally developed by a Mr. E. Bals of Micron sprayers and termed Controlled Droplet Application (C.D.A.)which means producing only the optimum sizes of spray droplet for the particular application. This idea became reality with the development of specifically designed spinning disc rotary atomizers in the early 1960's which break up the spray liquid into a narrow range of spray droplet sizes. Since then many engineers around the world have recognized the advantages of the concept and have developed numerous versions of rotary atomizers for both hand use and for agricultural aircraft.

Ideal droplet spectrum for various categories of application.

1. Flying insects	**2. Insects on surfaces**	**3. Plant diseases**	**4. Weeds**
10-50 micron spray droplets	**30-150 micron spray droplets**	**30-150 micron spray droplets**	**200-400 micron spray droplets**
Contact action	**Contact action**	**Contact action**	**Systemic action**

Example: Heavy infestation of aphids in wheat

Applications of chemical using large droplets and high volumes failed to kill these aphids using a product that only had "contact action", however when small spray droplets were used the applicator achieved 100% control of the aphids	

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Action of the chemical product.

When deciding what droplet size to use we should also check on the mode of action of the chemical product to be applied. As mentioned in my previous article if we are applying a product with only "contact action" then we must recognize that we can only achieve good control if we deliver the product to the target. Any product that is not delivered to the target is product LOST, resulting in undesirable environmental contamination.

Where do we want to deliver the chemical product; To the soil or to the foliage of the crop?

One of the best examples I have witnessed was an application of a biological insecticide product in rice. The grower requested my assistance in improving insect control and to increase operating efficiency of a Dromader M18 aircraft. Prior to my visit he was considering increasing the spray volume from 3 to five gallons/acre because of poor results. I asked what was the mode of action and if he wanted the product in the irrigation water or on the rice foliage. He replied that the product was systemic and he wanted it all on the foliage. We conducted an application at 3 gallons, and placed water sensitive papers horizontally on floating pieces of wood within the crop and also attached strips of paper to the leaves. The technical team observed excellent coverage on the horizontal papers, with very few droplets on the vertical papers.

Conclusion: The greater part of the spray was falling into the rice water and only a minimal amount on the foliage. That is a significant portion of the spray volume was being wasted.

My solution to this problem was to significantly reduce the droplet size, permitting a reduction in spray volume to 1.5 gallons/acre. We subsequently repeated the test and demonstrated to the astonishment of the local agronomist that with smaller droplets we had recovered dramatically fewer droplets on the horizontal cards and achieved many more droplets on the vertical cards.

This reduction in spray volume and in droplet size enabled the aircraft to treat a swath some 15 feet wider with excellent coverage.

Conclusion final: The Dromader M18 was able to treat a significantly larger area per day reducing fuel costs per acre, combined with major a economy in transport of water plus an improvement in biological control of the target pests.