



# The Importance of Aligning Your Nozzles

By Clint Hoffmann and Brad Fritz  
USDA-ARS Aerial Application Technology Group

With the beginning of another application season, this is a good opportunity for aerial applicators and their ground support crew to ensure that their spray systems are properly maintained to achieve peak performance. Most applicators likely monitor nozzle flowrate and wear, but how many check to see if their nozzles are properly aligned? In addition to the vertical deflection that is typically adjusted to change droplet size, the horizontal deflection can also change the size of the droplets as well as the spray pattern out of the nozzle.

## Nozzle Deflection Angles

Deflection refers to the nozzle angle relative to a horizontal flight line with a nozzle pointed straight back generally referred to as 0° deflection. The USDA Spray Atomization models ([apmru.usda.gov/aerial](http://apmru.usda.gov/aerial)) can be used to look at how changes in nozzle angle affect droplet size. For example, a 4008 flat fan nozzle at 40 psi flown at 140 mph will produce a volume median diameter (VMD) of 311  $\mu\text{m}$  at 0° deflection; however, the VMD drops to 186  $\mu\text{m}$  at 90° deflection (pointed straight down). More importantly from a drift control perspective, the percent of spray volume made up of droplets less than 100  $\mu\text{m}$  increases from 5% at 0° deflection to 28% at 90° deflection.

## Misaligned Nozzles

A strip with obstacles such as tall grass or even accidental movement by ground support crewmembers may potentially knock nozzles out of horizontal alignment, as shown in Figure 1, which also changes nozzle performance. Looking across a range of airspeeds (120–160 mph), a 15° nozzle misalignment reduced droplet size by about 15% and significantly increased small, driftable droplets. This is caused by increased air shear on one side of the flat fan resulting in a narrowing of the spray fan angle as well as decreased spray droplet size.

## Summary

While these issues are fairly minor compared to other preparations for the coming season, one should also remember that your spray nozzles are the last piece of equipment that comes into contact with the product you are applying and, as such, has the final say in both the droplet size and uniformity of the spray being applied. A few extra minutes spent walking your boom to ensure that all spray nozzles are properly deflected and aligned could significantly reduce the chances of any off-target movement. ■

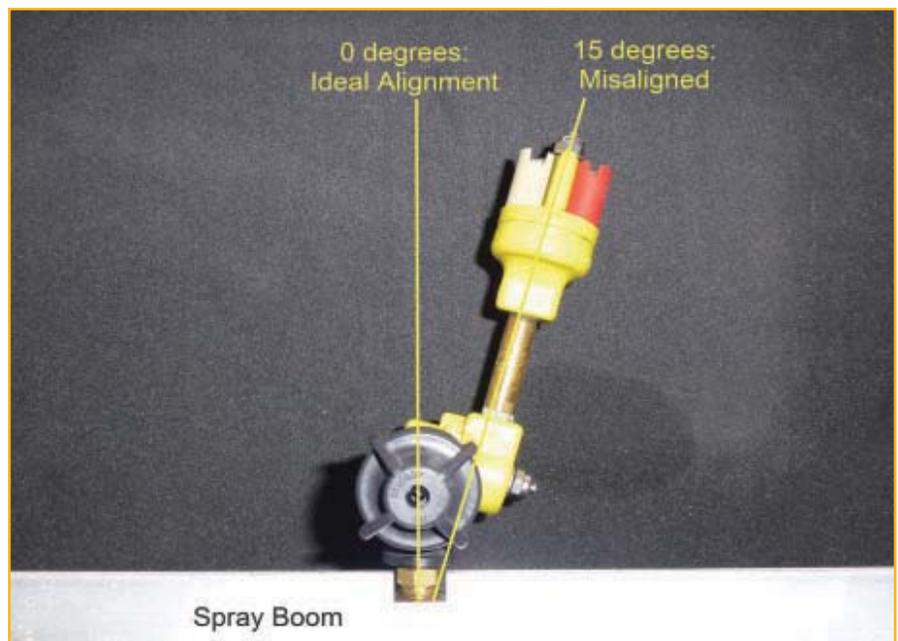


Figure 1. Top view of a misaligned nozzle, which can significantly change droplet size.