KEY TO HIGH VOLUME AERIAL SPRAYING IS AFS CHECK VALVE

22,400 gallons per hour is a lot of spray; however, this volume was successfully accomplished in July 1999 on a production model Air Tractor 802. Working in conjunction with Transland, Inc. and AeroFlow Systems, Air Tractor equipped the 802 with specially designed equipment to disperse 18 GPA at 160 mph with a 65-foot swath.

Responding to the growing need for high volume spray application, Air Tractor, Inc. equipped and tested the dispersal system required for 20 gallon per acre. High volume application is often favored by growers of certain vegetable crops for better spray coverage and for some forestry applications. Agricultural aviation can now offer customers this high volume option.

To achieve the high volume Transland, Inc. developed a 4-inch inlet pump, which discharges into a 3-inch spray valve and boom system. As the spray moves at 12 mph down the dispersal system, the liquid is divided at the strainer and sent to each 3-inch spray boom.

However, one area that is often overlooked is the flow rate through the check valve. Air Tractor decided on using the AFS ¼ standard check valve both because of its high capacity as well as its ability to eliminate leaks and dripping associated with the normal diaphragm check valve.
This AFS check valve is has a flow rate capable of 5. 3 gallons/minute at 25 psi. vs. 2.5 gpm for the Tee-Jet 4166 and 2.1 gpm for the CP check valve. The AT-802 was equipped with 84 AFS check valves.

Interestingly, the same flow rates could also be obtained by using only 64 check valves, but with larger spray tips. Nozzles used with the AFS check valves were Spraying Systems 2560-degree flat fan capable of flowing 4.6 gal. /min. at 26 psi.

How well did the spray system work?

> **Sam Cooke, Air Tractor, Inc. " the actual rate was calculated at 374 gallons a minute which translates to a 65 foot swath and just under 18 GPA. The AFS check valves were working fine. One thing I really like about the check valves and nozzle is that they are not near as heavy as the brass ones and so maneuvering would be better with this many nozzles and check valves. They are streamlined and not so much hanging in the breeze. The drift control also looks good."**
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> **Gary Coker, Air Tractor, Inc. – Research and Development, and Test flying. " my experience with the AFS check valves is that they are light, easy to install, easy to operate, and they don't create much drag. The test flight was at 160 mph and if it were slowed down to 140 the volume would be over 20 GPA…. I haven't seen the check valves leak at all.**

The AT-802 with the high volume dispersal system will be on exhibit at the 1999 NAAA Convention in Reno. Convention attendees will be able to take a closer look at the AFS check valve and its many unique features. Designed specifically for aircraft the AFS check valves on first observation appear large; however, when the aerial applicator considers the flow rates required for various applications, the check valves need to be of adequate size to handle the required volume. The chart in Figure 1 is a comparison of the flow rates of the various check valves at normal operating pressures. When designing a high volume spray system the flow rate through the check valve is a critical design factor.

The second observation is shape and color. Since the AFS check valve was designed for aircraft, its airfoil shape is important to keep air disturbance to a minimum especially in the spray boom area. The AFS check valve is molded of Celcon ™ plastic, which is the most chemical and weather resistant plastic affordably priced. Because UV radiation is very destructive to plastic products, inhibitors are added to keep the plastic from degrading in the sunlight as well as utilizing the black

color as a natural UV inhibitor. With the check valve components of Celcon ™ , stainless steel, and viton the applicator should expect a minimum lifetime of 5 to 10 years with normal use.

The most important part of the AFS check valve is the high capacity conical self-cleaning screen in front of the diaphragm (Figure 2). Diaphragm check valves leak because of particles which become trapped between the seal and the valve seat. The key is keeping the seal clean. AeroFlow Systems has found that simply by using a 20-mesh screen large foreign particles are trapped and eventually dissolved. The position of the screen keeps it clean and is normally maintenance-free all spraying season.

AeroFlow Systems offers the check valve not only in the standard model, but also in a model which can be turned off for a quick change in gallonage applications or servicing without getting spray on the ramp. Each check valve has a airfoil shaped leg properly positioning the check valve four inches below the spray boom. The check valves are designed to work with the most popular nozzles and work equally well in both low and high volume applications. Inlets of ¼ NPT and 1/8 NPT are available to adapt to different booms.

The AFS check valve is a valuable tool available to aerial applicators. By making the same check valve capable of both leak-free low and high volume applications, the aerial applicators can now demonstrate to society that it is an industry with integrity and professional standards.