Agricultural Aviation

Official Publication of the National Agricultural Aviation Association
www.agaviation.org

March/April 2011
Vol.38, No.2

The Science of Ag Aviation

Innovative research by the USDA-ARS Aerial Application Technology Group keeps aerial applicators on the cutting edge

The Industry Loses a Legend: Leland Snow 1930–2011

A FUNGICIDE THAT CONTROLS DISEASES, PROMOTES PLANT HEALTH AND HELPS DELIVER HIGHER CORN YIELDS?

And they said it would never get off the ground.

Headline AMP™ fungicide

BASF
The Chemical Company

Flying has always been fun. Add **Headline AMP**™ fungicide and it can be quite profitable too. **Headline AMP** combines the proven power of **Headline**® fungicide with a unique new triazole that stops diseases in their tracks. In a series of independent and university trials, **Headline AMP** delivered more bushels of corn per acre than any other fungicide.* Visit **HeadlineAMP.com** or talk to your BASF retailer today.

***In 29 independent and university trials conducted in 2008–2009**

FIELD SERVICE

(LITERALLY)

At a Price You Can Afford

Whether you need a lightning-fast field repair to get you back in the air or an end-of-season major repair to get you ready for next year's flying, Dallas Airmotive has the people and experience to get the job done – right. We've been performing OEM-authorized service on the PT6A series since the 1960s. We'll get you airborne again and help keep you there.

Fuel Nozzle Exchange Kits – Competitive Price Keep your engine running at peak efficiency. We'll overnight a kit containing nozzles, O-rings and gaskets. You simply switch out nozzles and return used ones to us*. Or you can save even more by sending your nozzles to us and we'll clean, flow-check and return to you in a one-day turn time. Either way, we offer OEM-standard kits and industry-competitive pricing.

OEM-Authorized Service Network Dallas Airmotive has the largest global field service team of any OEM-authorized, independent engine-service company. We're ready 24/7 to dispatch help wherever you are. We have eight regional turbine centers in the USA to ensure that you're never far from a center of excellence for PT6A repair.

Major and Minor Repairs Dallas Airmotive offers limited workscope repairs on PT6A AG engines to help save you money and speed turn times while addressing essential maintenance on your engine. Call us for a competitive quote.

AGRIGHT

POWERED BY DALLAS AIRMOTIVE

*Simplex nozzles, AG engines only.

For field support and OEM-authorized service to keep your engine and your operation running smoothly, contact Dallas Airmotive.

Tel +1 214-956-3001 • Toll-Free (USA) 800-527-5003 • AgRight@DallasAirmotive.com • AgRight.com

National Agricultural Aviation Association
1005 E Street SE, Washington, DC 20003
(202) 546-5722 • Fax (202) 546-5726
information@agaviation.org
www.agaviation.org

NAAA Staff

Executive Director/Executive Editor
Andrew Moore

Assistant Executive Director
Peggy Knizner

Office Affairs Coordinator
Margaret Dea

Director of Education & Safety
Kenneth Degg

Manager of Communications/ Agricultural Aviation Managing Editor
Jay Calleja

Coordinator of Government & Public Relations
Danna Kelemen

Editorial Message

Your opinions, ideas and contributions are welcome! To submit a letter for publication, please keep it under 200 words and include your name. We may need to edit your letter for clarity and length.

If you submit a story or picture for publication, we will do our best to handle your materials with care, but we cannot be responsible for their safety.

As for what you see and read in the stories and letters, we make every effort to ensure accuracy, but we cannot accept responsibility for the correctness or accuracy of information provided, or for opinions expressed.

Neither have we tested any of the products advertised in this publication, nor verified any of the statements made in the advertisements. We do not guarantee the fitness of any product, or the suitability of any advice or statements.

Subscription rates: $30 of NAAA domestic dues and $45 of international dues is for the annual subscription. Yearly subscription rate for non-members is $30 in the U.S. and $45 for international, including Canada. All subscriptions must be paid in U.S. dollars. Checks written on banks outside the U.S. cannot be accepted.

Reprints: All editorial material is available.

The purpose of NAAA shall be to advance the aerial application industry and its members in their efforts to enhance agriculture, and to protect the public health and the environment.

Advertising Information

To advertise in *Agricultural Aviation* or the 2011 NAAA Membership Directory, please contact Marshall Boomer, Advertising Sales Representative, at (800) 501-9571, Ext. 123, or marshall.boomer@theYGSgroup.com.

2011 NAAA Officers

President: Rick Richter, Calif.
Vice President: Mark Hartz, Ark.
Secretary: Chip Kemper, Idaho
Treasurer: Perry Hofer, S.D.

2011 NAAA Committee Chairpeople

Allied Industry: Chip Kemper
Awards: Tom Harkin
Budget & Finance: Perry Hofer
Communications & Public Relations: Gaylon Stamps
Constitution & Bylaws: Brett Dickerson
Convention: Bob Bailey
Government Relations: J.R. Reabe
Insurance: Jim Anderson
Long Range Planning: Rod Thomas
Membership: Brent Short
Museum: Drew Keahey
Nominating: Brian Rau
Research & Technology: David Eby
Safety & Federal Aviation Regulations: Ron Cline

Agricultural Aviation (ISSN 0745-4864) is published bimonthly by the National Agricultural Aviation Association. © 2011. **Editorial and circulation office:** 1005 E St. SE, Washington, DC 20003. **Change of address:** Please send notices to the circulation department and include your old mailing label with your new address, including zip and postal codes. Please also include your new phone and fax numbers. Allow two months for the change. **POSTMASTER: Send address changes to *Agricultural Aviation*, 1005 E St. SE, Washington, DC 20003.** Periodicals Postage Paid at Washington, DC and at additional mailing offices. Printed in York, Pa. Distribution coverage: Distribution includes NAAA members and those in related industries, educators, libraries, government officials and the news media.

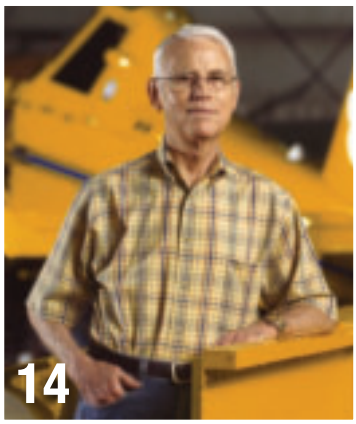
Contents

ON THE COVER

The USDA-ARS Aerial Application Technology Group at its facility in College Station, Texas

ALSO INSIDE:

The industry loses a legend with the passing of Leland Snow



The FAA is calling for operators to develop safety procedures for hot loading/fueling

COVER STORY

FEATURES

DEPARTMENTS

NOTES

Agricultural Aviation is the Official Publication of The National Agricultural Aviation Association

President's Message

Rick Richter

Innovation and Safety, Two Hallmarks of Professionalism

As the 2011 application season draws nearer, as professionals of the aerial application industry we need to take stock of ways in which we can improve our operations. By reflecting on our prior years' performances, we are better able to identify areas that need improvement. Keeping an open mind allows us to take advantage of the many new ideas we've learned by attending our state and national trade shows and conventions. From new nozzle designs and advanced GPS systems to airframe and power plant improvements, we need to adapt our businesses to maintain our professionalism.

I know what you are thinking, "If it ain't broke, don't fix it." Well, I've been guilty of following this age-old axiom before myself. But the truth is if you're not moving ahead, you're getting left behind. Where would we be today if we hadn't embraced GPS technology? Add to that flow controllers, GIS mapping, variable rate systems and right boom shut-offs to name a few.

What I'm actually trying to say is that if we take it upon ourselves to stay up to date and in tune with the latest and greatest the industry has to offer, then we can better call ourselves professionals. Our credibility is enhanced with the agencies that regulate us, and we can provide added value to the service we give our customers. Try changing just one aspect of your business this year and see how it goes. I think you will be glad you did, and the industry will be better for it as well.

Switching gears now, let's look at ourselves as we head into this first spray season of the new decade. Are we mentally and physically ready for the challenge that lies ahead of us? Long, hard days in the cockpit aren't that far off and we need to reassess our well-being prior to the rush. What's that you say, you've put on a few extra pounds during the holidays and can't seem to lose them? Establishing and maintaining a regular fitness program is key to enduring a long season. Eating sensibly and healthy goes along with fitness and promotes a better attitude for dealing with the everyday burdens of running a business.

Have we listened carefully to the message of our PAASS Program? Are we ready to apply the things we've learned about security and the human factors lesson in ethics? How about the drift mitigation module and the decision-making process that is so important to the conclusion of a safe application?

With the advent of new chemistry in crop protection materials we use today, are we aware of the physical properties of the chemical prior to its use? It's a good idea to communicate with other applicators in your area to become more familiar with a new product. I was once told by a friendly competitor that "we're all in this together" and it certainly has rang true for me on more than one occasion. Sharing information with your neighbors is a great way to keep the channels of communication open. You never know, someday you might need help and they'll be glad to return the favor.

By far the most sobering part of the hangar flying module is the summary of last year's ag accidents. The business we are in is very unforgiving of our mistakes. Safety has to be priority No. 1 and is probably the most important aspect of our business. Learning from the mistakes of others is a big part of this module. To sum it up, just don't take chances.

Have you ever heard the saying, "Safety is no accident"? My first airplane, an A model Ag-Cat, had a Mid-Continent decal in the cockpit that said "Safety is no Accident." It served as a constant reminder during my first years flying that airplane, that in order to get my airplane and me home at the end of the day, I needed to practice safety at all times. To me, this means making a conscious effort to prevent an accident. It can also be said that by being safe there will be no accident.

In closing, I would like to give a big "shout out" to all the PAASS presenters and the NAAREF team for their dedication and the sacrifices they've made to bring these life-saving messages to all of us. Let's apply them in our daily operations this year to raise the bar of professionalism in our industry. We can do it. Fly safe and be careful out there. ■

Executive Director's Message

Andrew Moore

The Future of Federal Aerial Application Research

NAAA has been a great supporter of the aerial application research conducted at the Agricultural Research Service's Aerial Application Technology Group (AAT) facility—a United States Department of Agriculture (USDA), federal government program. Over the past nine years, NAAA has successfully lobbied Congress to increase federal funding for this program by an additional $5.2 million. In the following pages of this issue you will find articles that touch on the importance of this research. In summary, the research conducted by the AAT has resulted in the design of aerial application technologies, tools and procedures that mitigate drift, make aerial applications more efficacious and result in fuel savings. Furthermore, it is through the development of these technologies, tools and procedures and their common usage in the field that we are able to keep regulatory agencies at bay from promulgating and enforcing overly restrictive application rules, such as buffer zones.

The research conducted by the AAT has resulted in the design of aerial application technologies, tools and procedures that mitigate drift, make aerial applications more efficacious and result in fuel savings.

AAT scientists have stood as experts for our industry countering claims that have been made purporting ag aircraft are a possible security threat able to spread chemical or biological weapons. Also, their expertise has been helpful in identifying and using scientific evidence to combat overestimates EPA makes about drift from aerial applications. Moreover, the AAT is being considered by EPA as one of the facilities to test the effectiveness of aerial application equipment to mitigate drift as part of EPA's Drift Reduction Technology (DRT) Program—a program that will rate the effectiveness of DRTs and allow buffer zone reductions and other restriction immunities to applicators that use such qualifying technologies.

The Aerial Application Technology Group has unique capabilities and resources at its disposal that no other research group has. In this picture, agricultural engineer Clint Hoffmann performs a spread factor analysis at the group's facility in College Station, Texas.

Unfortunately, because of the current fiscal state of our government, real concerns exist about maintaining the current amount of funding for federal programs such as the AAT. During his State of the Union speech this year, President Barack Obama proposed a five-year spending freeze for federal government discretionary spending. The current federal debt is $14 trillion dollars ($14,000,000,000,000.00) and growing, as is the interest on the debt. If federal spending policies don't change dramatically, we are heading towards deficit and debt levels that are clearly unsustainable.

The Congressional Budget Office projects that the deficit will reach 19 percent of the U.S.' gross domestic product (GDP) by 2040—approximately the same size as projected total revenues. At that point, interest on the debt is projected to be well over half of projected revenues. Needless to say, our government's fiscal house needs to be put in order and cutting federal spending as well as looking at growing federal revenues via tax increases and user fees are likely to be considered as ways to address these concerns.

When it comes to federal agricultural research dollars it is almost inevitable that we will see a cinching of budgets. We are already seeing a declining trend in federal agricultural research spending, and it is unlikely we will see this trend change. Only 2 percent of our country's population is involved in agriculture, and it is unlikely that this small percentage will be able to influence our nation's policymakers who set ag research spending budgets. NAAA's efforts urging the federal government to maintain current levels of aerial application research will continue but it will be a challenging undertaking.

So what can be done to address this situation? There is always the possibility of our industry funding its own research. Many different agricultural commodity interests do this via establishing "checkoff" organizations, which collect funds from its producers and use these funds to promote and do research on the commodity. The USDA is responsible for overseeing the formation of checkoff organizations under the authority of the Commodity, Promotion, Research and Information Act of 1996. Examples of marketing checkoff programs include the pork industry's "Pork. The Other White Meat" campaign and the beef industry's "Beef: It's What's for Dinner" campaign.

Establishing industry-wide research programs aren't without controversy. Congress has permitted producer groups to make checkoffs mandatory, and this aspect has generated legal challenges by some producers who contend they must pay taxes for activities they would not underwrite voluntarily. It is not necessarily a suggestion this writer is proposing; however, looking forward toward solutions to maintain aerial application research funding is important for this industry and solutions must be found. The ARS' AAT has done much good work for this industry. Aerial application must continue to technologically evolve to remain a vital component in modern agricultural production; yet strong consideration must be given to the likely reality that our government will not have the wherewithal to continue this same level of research. ■

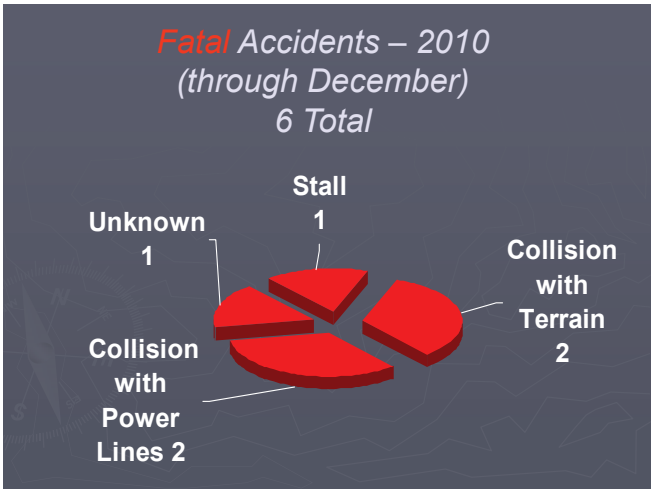
WNAAA President's Message

Julie Broussard

Safety for the Ones You Love

Ladies, I would like to talk to you about safety for your spouse as a pilot. I have worked alongside my husband, a pilot and operator, for 32 years as scheduler, bookkeeper, cook, etc. I've heard all the excuses from my husband and other pilots in regards to the cause of accidents. When I decided to write about safety, I asked him a few questions.

Many pilots may think they have a demanding job, which they do, but what can they do to make the job less stressful and safer?



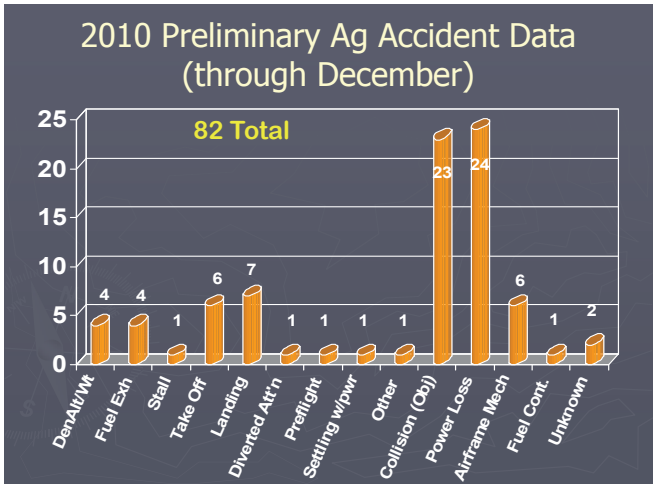
The majority of pilots are good and safe workers; however, accidents by pilot error are still too high. The Part 137 fatal accident report for the 2010 ag season showed 83 percent of the fatalities were attributed to pilot error. This could rise to 100 percent since the cause of one accident is still unknown. This amounts to one fatal accident out of every 14 accidents (6 out of 82). Why?

Women should be asking their husband and sons a few questions about how they start the day.

1. Are you in the right frame of mind to fly today?
2. Do you get to work early enough to prepare yourself for the day ahead?
3. Do you preflight your plane?
4. Do you know your limitations?
5. Do you know the aircraft's limitations?
6. Do you check the field out before diving into the field to make the application?

These are just a few of many questions you can ask.

Automobiles have safety equipment. Why don't all aircraft? Some aircraft have new technology. Airbags and low fuel warning lights are now being installed in new Air Tractors.



This has been done thanks to Leland Snow taking the lead in the ag industry. Mr. Snow was a true pioneer (see pg. 14). These safety items can be retrofitted on all older Air Tractor models. If your husband's aircraft manufacturer doesn't have safety features he can ask the operator to work with AmSafe and the aircraft manufacturer to get them. We women need to encourage them to do so.

When it comes to safety it takes more than a $500 helmet investment in his career to protect a pilot from himself. Even the most conscientious pilots need to be reminded of that sometimes, and that's where the care, concern and support of a loving partner come into play. Good luck this season in keeping our loved ones safe. ■

NAAREF President's Message

Rod Thomas

What is NAAREF?

What is this "NAAREF" and what does it do? I will try to answer that question in the next few paragraphs. The acronym stands for National Agricultural Aviation Research and Education Foundation. This 501c [3] organization is a non-profit sister to NAAA. It is the home of PAASS, Operation S.A.F.E., the new spill response video and many other safety-related projects and programs dealing with making what we do for a living safer and more professional. NAAREF is run with an independent budget by a 10-person board—all of whom are approved by the NAAA Board. I have been fortunate to serve on this board for several years, and this year was chosen to serve as president. (Elsewhere in this issue, on pg. 42, you will find a list of folks that are also giving of themselves in the form of a donation to the causes championed by this important organization.)

Some 11 years ago someone thought I might have what it takes to become a PAASS presenter. I was invited by NAAREF to attend a "train the trainer" session where I somehow was able to convince its leaders into believing that I was good enough to be one of them. My involvement—and love for this association—began then.

I feel privileged to serve my industry in this capacity because my initiation into being involved at a national level started here at NAAREF. Some 11 years ago someone thought I might have what it takes to become a PAASS presenter. I was invited by NAAREF to attend a "train the trainer" session where I somehow was able to convince its leaders into believing that I was good enough to be one of them. My involvement—and love for this association—began then. I had been a member of NAAA for some 25 years, had served in many local capacities, but had not given back to our industry at a national level. My participation from that beginning snowballed to the point that I feel comfortable in saying I have had some involvement in most current matters. Let's just hope it was positive.

NAAREF will continue on the path it now walks. Expect great PAASS programs to come from a dedicated group of program developers. Expect Operation S.A.F.E. to expand to the point it will become easy to have your aircraft certified at a fly-in. By the time you read this most of your seasons will have begun and hopefully you will have read your first-of-the-season "Fly-Safe" safety e-mail or fax from NAAREF.

While you enjoy a safe and prosperous flying season, rest assured, your dedicated NAAREF board members will be working hard to see that our way of life continues safely. All of us are open to hearing your suggestions or criticisms (NAAA's directors are listed in your directory and at www.agaviation.org under "NAAA's Partners"). I measure all board service by the willingness of members to contribute, whether their ideas are used or not. Rest assured, all ideas from membership will be considered and I look forward to hearing from my fellow ag pilots in the field.

Have a safe summer. ■

How EPA & State Pesticide NPDES General Permits Will Differ—And What It Will Mean To You

After several months of delays, the Environmental Protection Agency (EPA) expects to publish its final National Pollutant Discharge Elimination System (NPDES) pesticide general permit (PGP) in March (EPA hadn't finalized its permit as of this writing). But time is running out, for the court's April 9 deadline for nationwide PGP implementation is rapidly approaching. Not only must EPA implement its federal PGP in the six states it regulates (N.H., N.M., Idaho, Alaska, Okla., Mass.) by then, but the Agency must also complete its review of the PGPs being developed by the remaining 44 states. Many states have draft permits developed (about 20 have submitted them to EPA for review), but many other states are waiting to see EPA's final permit before developing theirs. Others also have legislative work to complete to clarify to their state authorities that they'll need to implement a PGP. With time running out, it's likely that many states won't finish in time, making it impossible for you and thousands of other regulated entities across the country to sort out your responsibilities and respond accordingly. Unless there's a deadline extension or agency decision not to enforce the permits immediately, this could be a veritable train wreck.

What Pesticide Uses Will PGPs Cover?

The EPA's PGP will apply to pesticide applications made directly to water or where pesticides will unavoidably reach waters of the U.S. when applications are made to: (1) control mosquitoes and other aquatic nuisance insects; (2) control aquatic weeds and algae; (3) control insects in forests; or (4) control invasive fish or other nuisance animals in waters of the U.S. Most state PGPs follow EPA's lead in limiting coverage to those four pesticide uses, although several would reach beyond those to add a fifth or even sixth category. For example:

- Illinois' PGP adds "other uses" (e.g., pesticide treatment of field crops, fruit crops, vegetable crops, seed treatments, etc.);
- New Jersey's PGP adds all agricultural activities conducted in "waters;"
- Arizona's PGP adds "other specific approval uses" without definition;
- Louisiana's PGP adds coverage of stormwater runoff from facilities that handle or use pesticides (providing coverage in a manner similar to "ag stormwater runoff" exemption);
- Texas' PGP adds "area wide pest control" in a very complex state PGP;
- Montana's PGP adds "piscicides" chemical substances which are poisonous to fish "for invasive fish control;"
- South Carolina's PGP adds "intrusive vegetation" (e.g., utility, railroad rights-of-way);
- Oregon's PGP adds "area wide pest control;"
- South Dakota's PGP adds "declared pest emergency situations, if water is present;" and
- New York's PGP covers *all* pesticide applications to, in or over waters.

Many individual state permits also will expand their PGP coverage to "waters of the state," which expands the permit's jurisdictional reach and enforcement from just waterbodies meeting the definition of "waters of the U.S." in the Clean Water Act (CWA) to cover almost all waterbodies in a state, often including utility rights-of-way, roadside ditches, ponds and non-flowing conveyances. For

State	Automatic Coverage Without Application to State?	Treatment Acreage Thresholds A=acres	PGP Requirements
NE	Yes, dischargers are automatically covered	None	Modest PGP requirements, including maintain equipment, report adverse incidents
LA	Yes, dischargers are automatically covered	None	Modest PGP requirements; Routine reporting is not required
SD	Yes, dischargers are automatically covered; Submission of annual report is required of those that exceed one-time application thresholds (not cumulative)	6,400 A forest or mosquito; 80 A water; 20 miles water's edge	Modest PGP requirements, including modified IPM, required of all permittees
FL	Yes, dischargers are automatically covered, except government agencies and pest control districts, which must apply for coverage	None	Modest PGP requirements for nongovernmental permittees; extensive PGP requirements for all government agencies and pest control districts
IA	Yes, dischargers automatically covered except those who exceed annual treatment thresholds	640 A/yr forest; 1,000 A/yr mosquitoes; 60A/yr or 60 mi/yr weeds; 20 A/yr or 20 mi/yr animal pest control	Modest PGP requirements for all permittees below thresholds; Extensive PGP requirements for those who exceed annual thresholds, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports
OH	Yes, dischargers automatically covered except those who exceed annual thresholds	640 A/yr forest or mosquitoes; 20A/yr water or 20 mi/yr at water's edge	Modest PGP requirements for all below thresholds; Extensive PGP requirements for those who exceed annual thresholds, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports
SC	Yes, dischargers automatically covered except those who exceed annual treatment thresholds	9,860 A/yr mosquitoes; 6,400 A/yr forest; 200 A/yr water; 20 mi/yr water's edge	Modest PGP requirements for all below thresholds; Extensive PGP requirements for those who exceed annual thresholds, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports
OR	Yes, dischargers automatically covered except those who exceed annual treatment thresholds	6,400 A/yr forests or mosquitoes; 20 A/yr water; 50 mi/yr water's edge weeds & animal pest control	Modest PGP requirements, including use of IPM, for all permittees; Extensive PGP requirements for all who exceed thresholds, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports
PA	Yes, dischargers automatically covered except those who exceed annual treatment thresholds	640 A/yr forests or mosquitoes; 100 A/yr water or 20 mi/yr water's edge weeds, animals	Modest PGP requirements for all permittees below thresholds; Extensive PGP requirements for those who exceed annual thresholds, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports
NY	No one is automatically covered	None	Extensive PGP requirements for all applications into or over surface waters, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports
WA	No one is automatically covered	None	Extensive PGP requirements for all applications into or over surface waters, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports
CA	No one is automatically covered	None	Extensive PGP requirements for all applications into or over surface waters, including submission of NOI, PDMP development, conduct IPM, keep extensive records, submit annual reports

example, of the 22 state draft permits that we've reviewed as of this writing (early February), only Iowa, Virginia, Arizona, Texas and California would limit their PGP coverage to "waters of the US." Other state PGPs that are directed to "waters of the state" also generally extend regulation of pesticide applications to "conveyances," such as roadside ditches and public drainage ditches that would have water in them at the time of pesticide application. Some like Florida only cover surface water, whereas others like Louisiana would cover groundwaters of the state. Many states won't allow PGP coverage for pesticide applications to especially pristine waters designated as Outstanding Natural Resource Waters (ONRWs), but others such as New York and New Jersey consider proper pesticide treatment important to keeping out invasive species and maintaining the water quality of ONRWs.

Who Will be Affected Under EPA and State PGPs?

Regardless of who issues them, the PGPs will add Clean Water Act (CWA) requirements and legal risks on top of the compliance required by the Federal Insecticide, Fungicide & Rodenticide Act (FIFRA) product labels. In the EPA PGP, most of the burdens will fall on those municipalities, state and federal agencies, mosquito control districts, irrigation districts or private organizations that exert decision-making or financial control over pesticide applications for the control of pests in, over or near rivers, lakes, swamps, irrigation and drainage canals, forests and other areas where water bodies or their conveyances are present. However, many state PGPs would regulate a much larger segment of the population than EPA's PGP would, depending on which state it is. Unless states change their draft permits as they finalize them to align with EPA's final permit, state to state variation in coverage could be extreme. Here are some examples of the degree of variation that currently exists among proposed state PGPs *(see table)*.

Changes EPA is Making to its Draft Permit

Taking a cue from state, public and Congressional (and perhaps White House) concerns about the problems of its draft PGP, EPA has signaled it will include numerous changes to the final permit to lessen the economic and technical burdens that compliance with the draft PGP would have imposed. We have learned that in its final permit, EPA will make automatic coverage available to a much larger portion of the total population of individuals and organizations that will be making these applications. For those automatically covered to comply with the CWA, they would likely just have to follow the federal product label and any state or local requirements that may apply, properly maintain and calibrate their equipment, keep limited records and report any adverse incidents.

Other permittees such as federal, state and local government agencies with pest control responsibilities, mosquito control districts and irrigation districts, will have to comply with all of the permit requirements. These requirements include submitting a Notice of Intent (NOI), conducting Integrated Pest Management (IPM), developing a Pesticide Discharge Management Plan (PDMP), monitoring of equipment maintenance and proper pesticide application, surveillance of the treatment site for possible adverse incidents, extensive recordkeeping, submitting an annual report, and reporting any adverse incidents.

EPA appears to be prepared, however, to lessen the PGP requirements that for-hire applicators and others that are not automatically covered by the PGP will have to do. EPA will likely require, for example, applicator compliance with FIFRA, proper maintenance and calibration of equipment, maintenance of detailed spray logs, and submission of reports of spills or any adverse incidents. Part of this is EPA's concern that it not overly burden small businesses, as defined by the Small Business Administration (under $7 million in revenues and 50 employees). The treatment of small business aerial applicators appears much improved over the draft PGP issued last summer.

A wild card is the potential for additional requirements coming from the U.S. Fish & Wildlife Service or the National Marine Fisheries Service (Services) to satisfy the Endangered Species Act (ESA). Under the ESA's consultation requirements, EPA and the Services must consider and address specific protections for endangered or threatened species and their critical habitat. EPA indicates that the consultation is not nearly over, and before it's done the Services could add ESA-specific requirements to EPA's final PGP either before or after its publication.

EPA Underestimated the Burdens

In a document EPA published late last year, the Agency estimated the economic and other burdens its June draft PGP would impose on permittees. NAAA and others were very critical of that document, charging that EPA had grossly *underestimated* the burdens. For example, EPA anticipates permittees would spend nearly 1 million hours and $50 million dollars annually to comply with the PGP. While those estimates would be significant burdens, NAAA pointed out that they don't come close

to the likely real cost in time and funds for permittees if EPA finalized the draft permit without serious revision. For example, EPA's estimate of the draft PGP's non-regulator (private parties) burden is that 5.7 million aquatic pesticide applications would be made to treat more than 100 million acres annually, and that 365,000 permittees will spend a total of 987,904 hours and $50 million annually to comply with the PGP. But this translates to just 2.7 hours/year and just $50 for each permittee—far below our estimates of the actual time and cost.

NAAA believes the true cost EPA's draft PGP could have exceeds $1 billion in the first year if EPA considers all permittees' costs and permitting authorities in all states. State water agencies responsible for developing state PGPs would also have to implement and enforce them, and the general poor economic health of states, counties and cities has led these organizations to put considerable pressure on EPA to accept a much less burdensome form of PGP. Mosquito control districts, water management districts and agricultural organizations all have pressured EPA in this manner. NAAA believes EPA got the message and has been working to revise its draft PGP to reduce the actual burden substantially before finalization. In many cases, EPA has adopted concepts and provisions from state permits that will reduce the burdens.

Seeking Legislative Fixes

Unless the Court's 2009 decision is overturned by Congress, the PGP and its CWA requirements will soon be law. The new Republican majority in the House of Representatives has made it clear that it will severely challenge many of EPA's (and other Administration agency) regulations. Last year legislation was introduced in both the House and Senate to reestablish the primacy of FIFRA regulations and prohibit the requirement of permits for pesticide applications. EPA's pesticide NPDES permit is seen by many lawmakers and their constituents as anti-jobs, and an unfunded mandate to state and local governments and agencies.

Pressure is mounting again this year for lawmakers to initiate legislation modifying the CWA to clarify that no NPDES permits are necessary for pesticides applied in accordance with FIFRA labels. A joint hearing between the House Agriculture Committee and the Transportation Infrastructure Committee—which has jurisdiction over the Clean Water Act—was held in mid-February on the

problems surrounding the 6th Circuit's decision and the EPA's draft NPDES PGP. It's too soon to see whether passage and enactment by the President is a possibility.

What You Should Anticipate

NAAA has been actively engaged throughout EPA's PGP development process and will continue to be. Even if you don't make the applications directly covered by these permits, it is wise that aerial applicators pay close attention to these new requirements. At the least, applicators will be required to minimize discharges to water bodies through use of best management practices. Thus, it will be important for applicators to develop and document written policies and compliance records for the following:

1. aircraft setup, calibration and maintenance;
2. proper handling of pesticides and containers;
3. procedures to avoid misapplication and drift; and
4. procedures for documenting spray jobs and meteorological conditions.

Since each state's permit system will be different, it's important for applicators to learn about the proposed NPDES permit policies for the states in which their application work will take place. Specific pages on NAAA's website [http://agaviation.org/NPDESpermits.htm] provide updated information about the EPA's PGP, links to State PGPs as they are developed and finalized, and other related information to the federal and state PGPs. Through this magazine, eNewletters and the NAAA website, we will continue to provide up-to-date information to help our industry prepare for and comply with the coming regulations. Check with us frequently during these final weeks before the court's April 9 deadline. ■

Dr. John Thorne is Senior Policy Advisor for Crowell & Moring LLP, a D.C.-based international law firm. He represent clients, including NAAA, on both political and technical aspects of a wide range of regulatory and legislative issues related to agriculture, agribusiness, food processing and the environment before EPA, USDA and Congress. Much of his expertise is related to water and air quality policy related to crop protection, fertilizer use and livestock production, but he has also represented clients on homeland security matters, tariff reduction and appropriations legislation.

IN MEMORIAM

Air Tractor Founder Leland Snow Passes

Leland Snow, founder and President of Air Tractor Inc., died Sunday morning, Feb. 20, while jogging near his home. He was 80 years old.

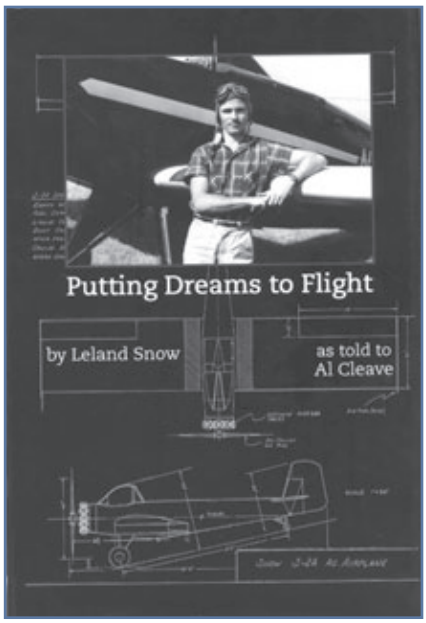
Snow leaves behind a 53-year legacy of aircraft design and innovations that ushered in the era of the modern aerial spray plane. Olney, Texas-based Air Tractor, the company he founded in 1972, produces 400, 500, 600, 800 and 1,000-gallon capacity aircraft used for agricultural purposes, forest and wildfire fighting, narcotic crop eradication, fuel-hauling, fighting locust plagues and cleaning up oil spills in coastal waters. Air Tractor aircraft are found working not only across the United States, but around the globe, in Canada, Mexico, Central and South America, North and South Africa, Australia, New Zealand, Spain, Italy, Croatia, Macedonia, Saudi Arabia and South Korea.

Air Tractor Inc. Founder and President Leland Snow, 1930–2011

Snow and Air Tractor have been important benefactors to NAAA and the National Agricultural Aviation Research and Education Foundation (NAAREF). This generous support helped NAAA purchase its own headquarters building and has helped develop substantive educational programs for the aerial application industry that have resulted in saving numerous ag pilots' lives and strengthened ag aviation environmental stewardship. NAAA Executive Director Andrew Moore said, "It is hard to think of a single individual who has contributed more to advance the agricultural aviation industry over its nearly 90-year history than Leland Snow. He will be missed, but he will also serve as an inspiration to this industry to build upon his many successes. The NAAA staff and board send our most sincere thoughts and prayers to the Snow and Air Tractor family."

Snow Ag Aircraft History

Leland Snow designed his first aerial spray airplane, the S-1, in 1951. The 23-year-old Snow completed test flights with the S-1 in 1953. Snow's S-1 flew dusting and spraying jobs in the Texas Rio Grande Valley and in Nicaragua until 1957. He followed up the S-1 with the models S-2A and S-2B, which were built when Snow moved to production facilities in Olney, Texas, in 1958.



In 2008, Leland Snow published "Putting Dreams to Flight," an autobiography of his career in aviation.

In 1965, Leland Snow sold his company to Rockwell-Standard and was appointed a Vice President of the Aero Commander division. During this time, the Model S-2R was developed and named the Thrush. The first 100 Thrush aircraft were built at the Olney division before the plant was closed and Thrush production moved to Georgia in 1970. More than 500 aircraft were produced under Snow Aeronautical Corporation and Rockwell-Standard in Olney.

Snow resigned from Rockwell and devoted the next two years designing the Air Tractor. Construction began in 1972 on the Air Tractor AT-300, which later became the AT-301. Air Tractor's first turbine engine powered aircraft, the AT-302, was introduced in 1977. In 1990, Air Tractor introduced the AT-802, the world's largest ag plane. By 2011, more than 400 AT-802s had been produced.

agricultural aircraft industry, helping to promote agricultural aviation, educate the public about the benefits of aerial agricultural spraying and supporting efforts to introduce and train young pilots in agricultural spraying careers. To that end, Air Tractor introduced in 2008 a two-seat, 500-gallon ag aircraft, the AT-504, which was specifically designed for on-the-job training.

"It is hard to think of a single individual who has contributed more to advance the agricultural aviation industry over its nearly 90-year history than Leland Snow. He will be missed, but he will also serve as an inspiration to this industry to build upon his many successes." —NAAA Executive Director Andrew Moore

In 2010, Air Tractor delivered its 2,500th aircraft to an aerial spraying operator in Brazil. In all, Air Tractor produced 123 aircraft last year, and its international sales accounted for more than 50 percent of its business.

Snow: More About the Man

Actively involved in Air Tractor aircraft design and manufacturing until his death, Snow was also a great supporter and contributor to the

In July 2008 Leland Snow transferred ownership of Air Tractor Inc. to its employees through an Employee Stock Ownership Plan. That same year Snow published an autobiography of his career in aviation, *Putting Dreams to Flight*. Snow was an avid runner and competed in three marathons, including twice running in the New York marathon. It was a common sight to see him running the streets of his Wichita Falls neighborhood.

Memorial Donations

Memorial donations may be made to the Professional Aerial Applicators' Support System (PAASS), which is a safety program for pilots sponsored by NAAA and NAAREF. Make checks payable to NAAREF (National Agricultural Aviation Research & Education Foundation) and mail to: NAAA, 1005 E Street SE, Washington, DC 2003. Please put "Leland Snow Memorial" in the memo line. ■

The 300th Snow aircraft, a 600 S-2C, was manufactured in 1965.

FACTS TO THE FUTURE

Innovative research by the USDA-ARS Aerial Application Technology Group keeps aerial applicators on the cutting edge

By Scott Bretthauer, Ph.D.
University of Illinois, Application Technology Extension Specialist

The Aerial Application Technology Group's Clint Hoffmann and Brad Fritz secure fishing line in an Illinois cornfield for an in-canopy swath analysis they are conducting with Scott Bretthauer, author of this article. The fishing line is used to measure multiple swath deposition patterns in corn.

Over the years as an Operation S.A.F.E. analyst, member of the PAASS Program Development Committee and a researcher involved with aerial application, I have developed a deep appreciation for the USDA-ARS Aerial Application Technology Group (AAT). They conduct a variety of research projects related to aerial application and provide valuable information to the industry. They also provide unbiased information that can be used to defend the aerial application industry against those who seek to regulate it more heavily. As United States agriculture continues to deal with various pest problems, it is critical for growers to have agricultural aviation available as the solution to their pest management problems. No other application method can provide the timely, effective and safe applications that agricultural aviation can.

Based in College Station, Texas, the Aerial Application Technology Group is part of the USDA Agricultural Research Service's Areawide Pest Management Research Unit. It is the largest aerial application research group in the country and has access to resources that no other research group has available. As AAT's lead

scientist, Dr. Clint Hoffmann leads a team of scientists, engineers and support personal committed to finding solutions to challenges facing the aerial application industry and agriculture as a whole.

The information supplied by AAT is used for three important purposes. First, it is used directly by aerial applicators to improve the quality of their applications. Second, it serves as an unbiased source that can be used by government regulatory agencies to assist them in developing reasonable regulations for our industry. Third, the data can be used to show growers who might use aerial application and the general public that aerial applications are both extremely effective and safe.

Since 2001, AAT has played a prominent role in dispelling the notion that agricultural aircraft could be used as a terrorist weapon to dispense biological weapons. While those of us in the industry recognize this is an impossible scenario, having AAT verify to the federal government that agricultural aircraft cannot be used as terrorist weapons has prevented the aerial application industry from being heavily scrutinized and subjected to additional security regulations.

The speed and effectiveness of aerial application means it is the only viable option for treating the outbreak of rapidly spreading destructive pests, particularly those invading from other parts of the world, such as soybean rust. Ensuring agricultural aviation remains a pest control option in the future is vital for United States agriculture. AAT provides the information that ensures it will be. In this article I would like to highlight research from AAT related to two topics important for the future of aerial application: reducing drift and improving the effectiveness of aerial applications.

USDA-ARS Aerial Spray Nozzle Models

One of the biggest and most important projects completed by the AAT group was the creation of the Aerial Spray Nozzle Models, which were completed in 2004. These models, which are available for download at http://apmru.usda.gov/downloads/downloads.htm, serve two very important purposes. First, they assist aerial applicators in selecting and setting up nozzles on their aircraft to achieve a droplet spectrum that will provide sufficient coverage for the product they are applying while also minimizing the risk of drift. Second, it provides irrefutable evidence to pesticide manufacturers, regulators and others as to the high quality of spray possible from aerial applications.

Developing the models was a complicated project. To begin the project, the USDA worked with NAAA to poll aerial applicators across the nation to determine the most commonly used nozzle types for aerial applications. These nozzles were then selected for evaluation. To simulate the high speeds used in aerial applications, a high speed wind tunnel was used to generate suitable airspeeds. An agricultural surfactant was used to mimic the spray solution characteristics of agricultural spray mixes. Each of the nozzles to be tested was then mounted at the outlet of the wind tunnel and operated at various orifice sizes, pressures, deflection angles and airspeeds. A laser diffraction instrument was used to measure the spray droplet size throughout the spray plume created by the nozzle.

The spray droplet models were then created using data from these tests. They allow an aerial applicator to select the nozzle type they are interested in using, the airspeed at which they intend to operate, the orifice size and pressure for their application, and the nozzle deflection angle. The model will then provide droplet size data for that particular setup. If the droplet size generated by the models is undesirable for the application, the applicator can quickly change various parameters until a more suitable droplet size is generated. This is a huge advantage, because the aerial applicator can quickly and conveniently test multiple nozzle types and settings right from the computer.

Information provided by the models includes spray droplet characteristics and the ASABE droplet spectra classifications. An example of the nozzle model output can be seen in table 1.What does all this mean to an aerial applicator? It means you can accurately assess how well you're

A number of pesticide labels approved by the EPA have mandatory buffer zones on all sides of the application site, downwind and upwind, for certain applications. Having AAT provide scientific proof that this is unnecessary is critical when working with the EPA to help them understand that upwind buffer zones provide no additional safety, and thus only serve to restrict agricultural production.

targeting the ideal droplet size for the product and pest (Dv0.5), what your risk of drift is (Dv0.1, % volume <100 microns and <200 microns), whether you are wasting spray in very large droplets (Dv0.9), and how wide your droplet spectrum is (relative span). There is not currently a comparable tool for ground applicators that provides the same level of detail as the aerial spray nozzle models.

When the EPA assesses the risk of drift from aerial applications for various pesticides being registered or re-registered, it often uses a fine droplet spectrum for its models. Using the USDA-ARS Aerial Spray Nozzle Models, it can be shown that many nozzle setups on agricultural aircraft produce a medium or coarse droplet spectrum when classified using the Dv0.1 value, which represents the portion of the spray volume at risk for drift. This means the EPA can run more realistic models when determining the risk of drift from aerial applications. Without the nozzle models, it would be difficult to prove to the EPA that using a fine droplet spectrum for their models is not realistic. NAAA is urging the EPA to use these types of third-party, scientifically valid models when it does its risk assessments on aerial drift of pesticide products.

40-DEGREE FLAT FAN NOZZLE (LARGE ORIFICE)
FOR USE ON FIXED-WING AIRCRAFT
AERIAL APPLICATORS SPRAY NOZZLE HANDBOOK
USDA ARS AH-726
I. W. Kirk, Agricultural Engineer, Areawide Pest Management Research Unit,
Southern Plains Agricultural Research Center, Agricultural Research Service, U. S. Department of Agriculture, 2771 F&B Road, College Station, TX 77845-4966, USA.

Directions: Enter 40 DEGREE FLAT FAN nozzle settings, pressure, and airspeed in the cells highlighted below.
(Atomization parameters are valid only with nozzle and operational settings specified in the Acceptable Range.)

	Nozzle Tip Size, (Enter 15 for 4015, etc.)	Nozzle Angle, degrees	Pressure, psi	Airspeed, mph
Acceptable Range:	10 to 30	0 to 90	20 to 60	100 to 160
	15	23	40	140

Atomization parameters are displayed in the box below.

CAUTION: Do not enter or clear data in the cells in this box!

$Dv_{0.1}$ =	174 µm	= Droplet size such that 10% of the spray volume is in droplets smaller than $Dv_{0.1}$.
$Dv_{0.5}$ =	303 µm	= Volume median diameter
$Dv_{0.9}$ =	465 µm	= Droplet size such that 90% of the spray volume is in droplets smaller than $Dv_{0.9}$.
RS =	0.96	= Relative Span
%V<100µm =	4.21 %	= Percentage of spray volume in droplets smaller than 100 µm diameter.
%V<200µm =	12.33 %	= Percentage of spray volume in droplets smaller than 200 µm diameter.
$DSC_{V0.1}$ =	COARSE	= Droplet Spectra Classification based on $Dv_{0.1}$.
$DSC_{V0.5}$ =	MEDIUM	= Droplet Spectra Classification based on $Dv_{0.5}$.
$DSC_{V0.9}$ =	FINE	= Droplet Spectra Classification based on $Dv_{0.9}$.
DSC =	FINE	= ASAE S572 AUG99 Droplet Spectra Classification

Table 1. An example spray nozzle model from the USDA-ARS Aerial Application Technology Group. This model is for a 40-degree flat fan with a size 15 orifice setup with 23-degree deflection and operated at 40 psi and 140 mph. This setup would provide a good balance between coverage and drift reduction. Note that while the overall droplet spectrum is classified as fine, the classification for the Dv0.1 value (the portion of the droplet spectrum that represents the risk for drift) is coarse. Many nozzle manufacturers use these models on their website to assist aerial applicators when choosing their nozzles.

The AAT group is currently planning on expanding their droplet size database even more. They intend to test pesticide formulations and adjuvants to determine the impact these products have on the droplet size. Recent studies along these lines found that glyphosate and foliar fungicides reduce the droplet size. Understanding how pesticide formulations and adjuvants impact droplet size will help aerial applicators set up their aircraft more accurately and better select and use adjuvants. In addition to testing actual pesticide products, AAT has tested several products in effort to find a "blank" that can be safely used at Operation S.A.F.E. fly-ins to mimic the impact that pesticide formulations have on droplet size and spray patterns. The goal is to use these blanks to improve the accuracy of pattern and droplet size testing at fly-ins.

The Aerial Application Technology Group's new high speed wind tunnel and droplet sizing system is capable of airspeeds over 200 mph.

AAT also recently installed a new high speed wind tunnel capable of generating even higher airspeeds so the models can be expanded to include speeds commonly used with larger, faster turbine aircraft. This new wind tunnel was used to answer a common question from aerial applicators: should I be using air-induction nozzles? AAT provided an answer in Savannah at the NAAA Convention—in a word, no (*see pg. 25*). As the additional research is completed with various pesticides and adjuvants and at higher airspeeds,

aerial applicators can expect updated and easier to use nozzle models.

Other Drift Reduction Projects

Other projects dealing with drift included examinations of drift reduction additives using both laboratory and field trials. The goal of using any drift reduction adjuvant is to reduce the risk of drift by reducing the formation of small, drift-prone droplets. One concern is that the drift reduction additive increases the overall droplet size, which can have a negative impact on coverage and application effectiveness. The AAT group has conducted field trials to measure how well various drift reduction adjuvants reduce the downwind deposition of sprays. Evaluating these products in their high speed wind tunnel then allows them to evaluate how the products change the overall droplet size so that aerial applicators can be sure they chose a drift reduction adjuvant that lowers their risk of drift but does not reduce the effectiveness of their application. Additional work with drift reduction adjuvants will also likely be a part of future research plans.

The Aerial Application Technology Group consists of five scientists and six support personnel, including, from left to right: Phil Jank, Dr. Juan Lopez, Curtis Hubbard, Dr. Dan Martin, AAT pilot Lee Denham, lead scientist Dr. Clint Hoffmann, Charlie Harris, Dr. Yubin Lan, Chris Parker, Dr. Brad Fritz and Dr. Mohamed Latheef.

The AAT group also conducts research related to weather conditions and drift. In recent years they have focused on inversions in order to help aerial applicators better understand how drift occurs when applications are made during an inversion. Results from these projects have been used in the PAASS program in order to better educate aerial applicators about how to identify inversions so that applications can be avoided when they occur.

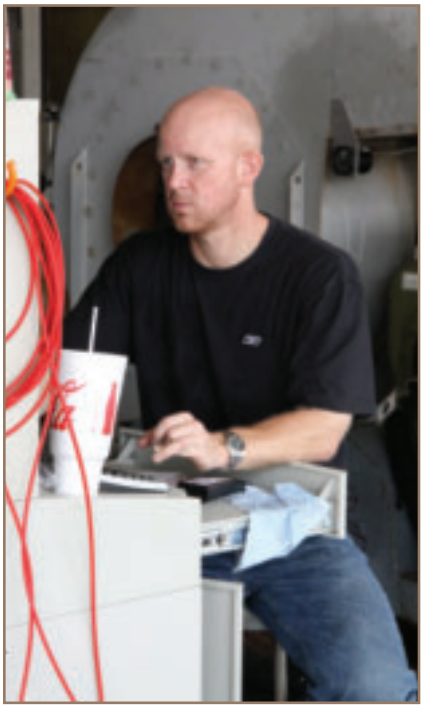
Establishing reasonable buffer zones is another issue affecting the industry. One important paper where the lead author was a member of the AAT group deals with the use of buffer zones during aerial applications. The article reviewed research and models related to drift to examine whether upwind buffers zones are needed for aerial applications. The authors concluded that a review of the research does not support the need for upwind buffers zone for aerial applications carried out in wind speeds greater than 3 miles per hour. In fact, the only time upwind drift is possible is when the upwind vortex from the aircraft exceeds the force of the wind. Even in these situations, the material deposited upwind of the upwind edge of the swath and the upwind distance it is carried is very slight. Since aerial applicators are taught, through the PAASS Program and other pesticide education programs, to avoid applications when wind speeds are less than 3 mph, it can be concluded that upwind buffer zones are not necessary. While this may seem obvious, it is important to remember that a number of pesticide labels approved by the EPA have mandatory buffer zones on all sides of the application site, downwind and upwind, for certain applications. Having AAT provide scientific proof that this is unnecessary is critical when working with the EPA to help them understand that upwind buffer zones provide no additional safety, and thus only serve to restrict agricultural production.

Pest and crop-specific projects that AAT conducts provide two benefits. For aerial applicators, they provide useful information on nozzle selection, aircraft setup and operation for achieving the best pest control. For others, they provide proof that aerial applications, and in particular low volume applications, are very effective for controlling pests.

The AAT group is also involved with the EPA's Drift Reduction Technology (DRT) Program. The concept of the DRT program is to provide an incentive to all applicators, not just aerial, to use technology proven to reduce the risk of drift during pesticide applications. The use of DRTs, according to EPA's draft policy,

can result in reduced buffer zone distances for applicators making an application. AAT is working with the EPA to develop testing procedures to evaluate DRTs, which can include nozzle type, setup, drift reduction adjuvants and operation parameters. The testing procedures involve the use of multiple samplers placed downwind of the application, both on the ground and on towers. Deposition on these downwind samplers from the various DRTs is compared with deposition from a reference application setup. This comparison is then used to calculate how much each individual DRT reduced drift. A preliminary study showed that the use of an aerial flat-fan nozzle reduced drift between 70 percent and 84 percent, depending on the airspeed, from that of the reference spray system. *[Editor's Note: See pg. 26 for further information about that study.]*

NAAREF relies heavily on AAT to prepare the drift mitigation module for the PAASS Program. Data from their research projects are often used within the modules, which are presented to approximately 1,700 ag pilots and operators nationwide. AAT's research engineers readily allow themselves to be filmed explaining various points about drift reduction, and they serve on the Program Development Committee offering their expertise for the module's content. The PAASS Program is recognized by both the FAA and EPA as an outstanding safety education program, and since its inception, the number of ag aviation related accidents and drift complaints have gone down. Because of the substance of the PAASS Program and proven results in strengthening the industry's stewardship—thanks to the quality of the curriculum as developed by the AAT group and other ag scientists—insurance companies offer many ag pilots and operators that participate in the program a reduction in insurance costs.



Brad Fritz enters data into the Aerial Application Technology Group's droplet sizing system.

AAT Application Efficacy Research

In addition to drift reduction research projects, the AAT group conducts various projects examining the effectiveness of aerial application scenarios. AAT researchers have undertaken a wide range of projects to determine the optimum nozzle type, setup and spray volume for different pests. These projects have included studies to examine the best method for controlling fusarium head blight, a major disease pest of wheat and barley. AAT has also played a key role in determining the best spray setup for making low volume foliar applications of fungicide on corn. Applying glyphosate at low volumes has also been investigated by AAT. These pest and crop-specific projects provide two benefits to the aerial application industry. For aerial applicators, they provide useful information on nozzle selection, aircraft setup and operation for achieving the best pest control. For others, they provide proof that aerial applications, and in particular low volume applications, are very effective for controlling pests.

Future work will continue to deal with drift reduction and improving application efficacy. In addition, AAT is working to develop new equipment for use at Operation S.A.F.E. pattern testing fly-ins. The group's facilities also serve as a location for calculating spread factors, which are used to calculate droplet size and deposition from water sensitive and Kromekote papers. Without the correct spread factor, the exact droplet size cannot be measured. This allows Operation S.A.F.E. analysts and researchers to evaluate the impact of various spray formulations on the spray pattern and droplet size in the field.

The importance of the work conducted by the AAT group cannot be overstated. Besides the information they provide to aerial applicators to help them improve the safety and efficacy of their applications, the ability to dispute false claims from those unfamiliar with agricultural aviation is invaluable. I have personally stopped more than one conversation with those opposed to aerial application by providing data from AAT, in particular the Aerial Spray Nozzle Models. AAT provides the aerial application industry with an unbiased source of information that can be used to improve the accuracy of aerial applications, develop reasonable regulations for our industry and prove to our customers the quality of our work. These facts will help ensure a positive future for aerial application. ■

This Guy Knows Aerial Application

A Q&A with Dr. Clint Hoffmann

The premier agricultural aviation research body in the United States lies deep in the heart of Texas. Down in College Station, the Aerial Application Technology Group (AAT) and its team of scientists, engineers and support personnel are devoted to developing technologies for aerial applicators that mitigate drift and result in more efficacious applications. As this issue's cover story documents, the aerial application industry has benefited from AAT's findings in numerous practical ways. How does AAT determine its research projects? What's on the horizon? How would cuts in federal funding for AAT research impact the industry? *Agricultural Aviation* posed these questions and more to Clint Hoffmann, AAT's lead scientist for aerial application research. In 2009, Hoffmann received NAAA's Outstanding Service Award. He is an outspoken supporter of aerial application and has advocated on the industry's behalf before numerous outside groups and government agencies. In the responses that follow, Dr. Hoffmann takes readers inside the Aerial Application Technology Group and elaborates on the work he and his team of researchers are doing to keep aerial applicators on the cutting edge of technology. *–Jay Calleja, Manager of Communications*

Agricultural Aviation: What kind of impact do you think the USDA-ARS and AAT specifically have had on the aerial application industry?

Clint Hoffmann: The Agricultural Research Service (ARS) serves the needs of American agriculture by providing long-term research programs that address nearly every aspect of agriculture. ARS has two programs (College Station, Texas, and Stoneville, Miss.) that service the aerial application industry. The research missions of these two groups include development and evaluation of new spray equipment and product, spray modeling, precision application, remote sensing of crop conditions and disease stress using multi-spectral cameras mounted on aircraft, product efficacy testing and decision support systems to help aerial applicators make informed decisions quickly and efficiently. Through these research projects, aerial applicators are provided with objective evaluation of numerous products as they come onto the market. Applicators are also provided guidelines and best management practices that lead to more effective spray applications.

AA: How does USDA-ARS decide whether to conduct a particular aerial application research project?

CH: Every ARS research group has a five-year research plan that gets developed through consultation with user groups, ARS National Program leaders, outside experts and the ARS scientists in the project. When putting this plan together, the goal is to lay out a road map that says if this research program completes these three to six objectives, then the program will be successful and serve the needs of their user communities. There are specific accomplishments that are detailed in the plan that the scientists in the project are tasked with completing.

Clint Hoffmann, Agricultural Engineer and Lead Scientist of the USDA Agricultural Research Service's Aerial Application Technology project

Each year around December or January, our group gets together to lay out our research plans for the upcoming year. While keeping an eye on the specific accomplishments that are part of the five-year plan, we also talk about research projects that need to be done related to upcoming issues facing the aerial application industry. Many of these issues are identified in discussions with the NAAA Research and Technology Committee at NAAA Board Meetings and by talking with aerial applicators at the national convention, state conventions or on the phone. These discussions help us to decide if we have the in-house resources to complete a particular project or if we need to collaborate with others outside our group.

AA: What are some major breakthroughs that the Aerial Application Technology Group has achieved that have been beneficial to the industry?

CH: The product that is most commonly used by aerial applicators is the spray atomization models that were first developed by Dr. Buddy Kirk and are currently being updated

and further developed by Dr. Brad Fritz. These models allow aerial applicators the ability to input their application parameters (nozzle type, orifice, airspeed, pressure, orientation) and determine what size of spray droplets they are producing. If a pesticide label requires a certain size of spray droplet, the applicator will know if they are compliant or can change the application parameter to meet the labeled requirements. The newest models are being extended from 160 mph maximum airspeed to 200 mph to meet the needs of applicators who are using some of the newer and faster aerial application aircraft. These models are available on our website at http://apmru.usda.gov/downloads/downloads.htm and some nozzle manufacturer's websites. We are currently in the process of transferring these models into smartphone apps so that aerial applicators can access them more readily.

AA: What can you tell us about equipment/technology that the Aerial Application Technology Group has patented or made available for industry use?

CH: Dr. Jim Carlton patented the aerial electrostatic spray system that is currently being sold by Spectrum Electrostatics Systems. Our group has recently applied for patents on a new volatile organic compound (VOC) sensor and an insect bioassay cage. These last two items are designed to address upcoming issues that may impact the industry. For example, in some areas of California, there has been discussion about "no spray days" to prevent some VOCs associated with pesticide applications that may contribute to the production of ozone and smog. There has been very little field verification of the role of pesticides on VOCs released into the environment. Therefore, to complete field studies associated with VOC detection, we needed more economical sensors for this work. The bioassay cage will lead to more effective evaluations of product used to control mosquitoes.

Our group also works with numerous adjuvant manufacturers to investigate the effects of different adjuvants, often experimental, on spray droplet size. These studies are directed at developing products that can reduce the production of small, drift-prone droplets. Additional studies are conducted on numerous pesticides to determine the impact of application parameters on product efficacy. Studies with new chemistries are initially conducted in a spray table to look at a wide range of droplets sizes and spray rates until the optimal combination is found. Then, field studies are conducted with our aircraft to confirm that careful attention to the application parameters are needed to make the most efficacious application. These recommendations then show up as recommended or required application conditions on product labels.

AA: What kind of information do you provide to the EPA when it is evaluating the drift potential of aerial applications, and what role do you play in discussions with EPA related to reducing drift?

CH: The EPA's Drift Reduction Technology (DRT) program is a good example of our group's approach to long-term research directed toward future needs or developments that will impact the aerial application industry. When the DRT program was first being developed, we realized that some aspects of the program could have a significant impact on the materials and methods applicators use in their daily operations; therefore, we took an active role in the DRT program. Over the last five years, our group worked with other researchers to develop the testing protocols and verification procedures that will be used to objectively evaluate a DRT (nozzles, spray modifications, adjuvants, etc.). By publishing these protocols and procedures in peer-reviewed journals, we are providing the data needed by EPA to make science-based regulations.

AA: NAAA has been a strong advocate for the USDA-ARS Aerial Application Technology Program in the halls of Congress and with federal regulatory agencies, and you and your team have been equally strong advocates for sound science and the aerial application industry. How would you characterize the relationship between NAAA and USDA-ARS?

CH: All of our scientists see the aerial applicator as our main customer group and are committed to serving aerial applicators. Scientists in the AAT commonly consult with NAAA personnel in addition to partners in industry as well the applicators in the field to provide scientific support when addressing these changing and often volatile issues. The AAT group serves as a general clearinghouse of scientific information and data for a multitude of user groups including university, state and federal research groups, industry partners, involved professional organizations—including NAAA, ASABE [American Society of Agricultural and Biological Engineers], ASTM International [American Society for Testing and Materials], CPDA [Chemical Producers and Distributors Association], etc.—private research entities and the applicators themselves. These relationships result in numerous collaborative research relationships often allowing for the completion of larger research projects that could not be completed by any single partner. Additionally, the research conducted by the AAT is

continually transferred to users through professional publications averaging nearly 20 publications a year over the last couple of years.

AA: All federal discretionary spending seems to be constricting. What would happen in the aerial application industry if this funding was markedly decreased or eliminated?

CH: The Aerial Application Technology (AAT) group is the largest aerial application research group in the country with unique capabilities and resources not available to any other research group allowing for dedicated aerial spray technology research. The high and low speed wind tunnels with the capability of assessing aerial spray systems using active ingredient spray formulations are unique resources to this research program in the U.S. The group's dedicated research aircraft with available hanger and airport space allow our group to address and respond to research questions that no one else does. Since the group's aircraft fall under the government aircraft certification, they are uniquely qualified for development and early prototype testing of equipment and aircraft modifications that will help aerial applicators. During this development process, the AAT aircraft can be modified or equipment placed on the aircraft without having to go through the lengthy FAA approval process. Examples of products that have been tested on AAT aircraft include flow control systems, auto guidance systems, wingtip modifications, lowered spray booms, aerial electrostatic equipment and wing mounted spray pods.

If the AAT group were to disappear, initially the agricultural aviation industry would lose its ability to quickly respond to changing regulatory mandates and emerging issues that impact daily business operations. The AAT continues to provide the industry applied research that supports safe, effective and efficacious practices. Without these resources and guidance, the agricultural aviation industry would lose access to state-of-the-art best management practices and would lose a significant part of its ability to evolve toward more improved application practices and systems. This would ultimately lead toward a decrease in applicator effectiveness with an increase in adverse impacts to off-target persons, animals and crops, resulting in punitive legal actions and potential decrease or cessation of their daily business operations. Collectively, all of this would lead to aerial applicators losing the ability to support the American food, feed and fiber industries, ultimately resulting in losses in each as a result of these industries not having adequate resources to respond to crop pest and production issues.

AA: The support for the aerial application industry from the network of scientists not only at USDA-ARS but at other universities and organizations is impressive. Can you talk more about some of the joint ventures you undertake?

CH: Our group has worked with a wide range of researchers and growers over the years. For example, we have conducted studies in cotton in Arizona and Texas, wheat in North Dakota, South Dakota and Minnesota, corn throughout the Midwest, and orchards in California, Texas and Florida. These field studies allow us to work with researchers and applicators in these areas who have the knowledge and experience in the local area. Many of the joint research projects start from discussions at professional meetings and at NAAA conventions. Since field research is a very expensive undertaking, we can leverage both the financial and personnel resources of another researcher to complete these types of research projects.

Another example of how our cooperation with outside organizations benefits the aerial application industry has been our four-year involvement in the Department of Defense Deployed War-Fighter Protection Program (DWFP). Our expertise in droplet sizing and equipment evaluations supports this program's need for objective testing and development of vector control application equipment. The DWFP's financial support of our program, in turn, has allowed us to add to and upgrade our research equipment with the acquisition of two laser diffraction droplet sizing systems and a new high speed wind tunnel, as well as purchasing two unmanned aerial vehicles (UAV) for some of our remote sensing work. All of this supports our study of aerial application, including further support and development of the spray nozzle models. These new laser systems have also allowed our group to provide much needed support to ground and aerial citrus applicators to comply with new pesticide labels allowing for timely treatment of citrus orchards for Asian citrus pysllids.

Finally, funding from ExxonMobil allowed our group to study methods for applying oil dispersants from agricultural and specialized aircraft. This work was complete and published prior to the Gulf oil spill, allowing us to aid the response efforts with the generation of two white papers documenting that aerial applicators and a 747 could meet the application and regulatory guidelines to apply oil dispersants over the Gulf of Mexico.

AA: How do you get the results from your research projects out to the aerial application industry?

CH: One of our main efforts is to present the projects that are the most applicable to aerial applicators at the NAAA/ASABE Technical Session at the NAAA National Convention. We try to tailor the presentations so that applicators can use the results in their daily operations. We also place all of the papers and presentations from the Technical Sessions on our website. Many of our research projects and results support Allied Industry members such as nozzle and adjuvant manufacturers. We meet with these Allied Industry members at other professional meetings throughout the year. Since we are a scientific group, we publish a lot of our research in peer-reviewed journals. We are currently in the process of creating Applied Research Summaries for each of our peer-reviewed manuscripts to make the research results easier to understand. *[Editor's Note: see pg. 25 for an example of these one-page summaries.]*

AA: Can you talk a little bit about the new equipment you are developing for Operation S.A.F.E. fly-ins?

CH: Hopefully, everyone reading this article has been through an Operation S.A.F.E. clinic and/or had their aircraft's pattern evaluated at a fly-in. The swath analysis system developed by WRK Inc. is the most common method for evaluating an aircraft spray pattern using a dye in the spray tank and analyzing the pattern with a cotton string stretched across the flight line. The current WRK system uses an older model fluorometer to read the amount of dye that deposits on the cotton string. This model of flouorometer is no longer manufactured and new ones are quite expensive. Our group has developed an analysis system to replace this fluorometer that can not only evaluate the amount of dye on the line more quickly but will also output the results in real-time. This will speed up fly-in pattern testing. We are currently working with Scott Bretthauer and other supporters of the aerial application program to make this system available to S.A.F.E. Analysts in the upcoming year.

AA: How does the aerial application industry of today compare to the industry when you first joined USDA-ARS in 1989?

CH: The level of professionalism in the industry has been the biggest change that I have seen. Gone are the days of just some crazy guys who just like to fly and aerial application just happens to be their reason to fly. Today's aerial applicator is a businessperson with a passion for flying and feeding the world. Their level of knowledge about all facets of the industry has really grown and they are committed to keep gaining more knowledge. ■

Applied Research Summary

Role of Air-Induction Nozzles in Aerial Application Conditions

Original Citation: Hoffmann, W.C., B.K. Fritz, W.E. Wolf, D.E. Martin, Y. Lan. Role of air induction nozzles in high speed airstreams. ASABE Section Meeting Paper No.AA10-001. St. Joseph, Mich.: ASABE.

Keywords: Air induction nozzles, air induction, droplet size, aerial application, ai nozzles, spray atomization

Research Objective: To measure the spray droplet spectra from air-induction nozzles under aerial application spray scenarios (airspeeds from 120–180 mph).

Research Methods: Air induction nozzles have been used for several years in ground spray applications as a means of generating large droplets and reducing the potential for off-target movement of sprays. Some of the advantages of AI nozzles are larger droplets sizes with less fines at normal operating pressures, better efficacy with some products, and potentially a larger range of operational pressures without significant changes in droplet size. As these advantages have only been tested for ground applications, this project focused on aerial application conditions. It is important to gain a thorough understanding of how these air induction nozzles work in high speed airstreams before placing them on aerial application equipment. Five 110 degree flat fan AI nozzles and one standard (non-AI) 40 degree flat fan nozzle were tested at 3 airspeeds (120, 150, 180 mph). All nozzle evaluations were conducted at a spray pressure of 60 psi using a water nonionic surfactant (NIS) solution (water + NIS at 0.25% by volume) (R-11, Wilbur-Ellis Company, San Antonio, TX). The water plus NIS solution was used because it is a good simulant of most water-based insecticide sprays. A Sympatec Helos laser diffraction droplet sizing system (Sympatec Inc., Clausthal, Germany) was used to measure the droplet size generated by the nozzles. For each airspeed tested, the spray plume from each nozzle was traversed vertically through the laser beam and measurement of the droplet sizes generated were measured.

Research Results: For all 5 AI nozzles and the conventional flat fan nozzle, the volume median diameter decreased by about 50% as the airspeed was increased from 120 to 180 mph. Similarly, the portion of the spray comprised of small droplets, expressed as percent of spray volume contained in droplets less than 100 µm in diameter, significantly increased as the airspeed increased. Comparing the droplet sized created by AI nozzles to the conventional flat fan nozzle, there are no significant differences. This is a result of the high air shear placed on droplets as they exit the nozzle and encounter the high speed air.

Research Application:

- Based on the results of these studies, the AI nozzles did not increase droplet size or decrease fine spray particles as compared to a conventional flat fan nozzle.
- There is little differences between the two nozzle types due to a combination of the high speed air negating the air induction system of these nozzles and the high air shear placed on the spray droplets at airspeeds of 120–180 mph. ■

Spray Drift Reduction Evaluations
of Spray Nozzles Using a Standardized Testing Protocol

Editor's Note: *Over the last decade the USDA-ARS Aerial Application Technology Group has steadily increased the number of peer-reviewed scientific articles it publishes to the point that it is averaging nearly 20 peer-reviewed publications a year. This paper on drift reduction testing protocols was originally published last year in the* Journal of ASTM International. *What follows is an abridged version.*

AUTHORS
W. Clint Hoffmann and Bradley K. Fritz
USDA-ARS
College Station, Texas

Jonathan W. Thornburg
RTI International
Research Triangle Park, N.C.

W. E. Bagley
Wilbur-Ellis Company
San Antonio, Texas

Norman B. Birchfield and Jay Ellenberger
US EPA
Washington, D.C.

Summary
The development and testing of drift reduction technologies has come to the forefront of application research in the past few years in the United States. Drift reduction technologies can be spray nozzles, sprayer modifications, spray delivery assistance, spray property modifiers (adjuvants), and/or landscape modifications. A protocol for testing DRTs in high speed wind tunnels has been previously reported and was expanded to test spray nozzles. This manuscript reports on the initial implementation of the DRT program for conducting DRT evaluations of three spray nozzles under high speed conditions (i.e.,45–65 m/sec (100–140 mph)), which are relevant to the aerial application of crop production and protection materials. The spray nozzles were evaluated in the USDA-ARS High Speed Wind Tunnel facility. Droplet size of each of the nozzles with different airspeeds, spray pressures, and orientation were measured with a Sympatec Helos laser diffraction instrument. The droplet size spectra for each test was input in a spray dispersion model (AGDISP), which calculates the downwind drift expected from a typical aerial application scenario. As compared to the reference nozzle (Flat fan 11003 at 43 psi), the three spray nozzles reduced spray drift by 70–84 percent as compared to the reference nozzle. The nozzles generated spray droplets with volume median diameters 60–80 microns (μm) larger than the reference nozzle. One of the aerial application industry's Best Management Practices (BMP) is to not spray directly on the downwind edge of a field. The spray swath near this edge is moved upwind (i.e. offset) by ½ to 1 swath width. When this BMP was combined with the drift reductions from the spray nozzles, the amount of drift reduction was slightly increased; however, application efficiencies increased to 93–96 percent. These results demonstrate the possibility of combining multiple drift reduction techniques and technologies to greatly reduce spray drift.

Introduction
The first step in implementing the EPA-Drift Reduction Technology (DRT) program is to develop a set of protocols, standard operating procedures and data quality assurance steps so that the results from any trials or research conducted are scientifically valid and repeatable; data quality and protection must also be maintained throughout the study. Best Management Practices (BMP) are common industry practices that are used to apply agrochemicals to optimize swath deposition while minimizing off-target movement. For aerial applications, common BMPs are identification of sensitive areas around a field to be sprayed, modifying spray applications to account for changes in wind speed and direction, proper equipment setup to optimize agrochemical delivery and other professional practices all directed at making the most effective spray application. One common BMP is the use of a swath offset to minimize off-target deposition when an application is made near a downwind field edge.

Sampling spray swath uniformity in cotton fields using cotton string. The balloon in the background in used to lift the string up out of the cotton so that it can be collected on reels for later analyses.

Atomization of the spray from nozzles is influenced by nozzle type, pressure, orientation, airspeed and spray solution. All of these factors are researched by the Aerial Application Technology Group.

This practice involves moving a spray swath some distance upwind of a downwind field edge while spraying in a crosswind.

Objective: To evaluate the DRT testing program for aerial applications under high airspeeds (i.e. >100 km/hr (~60 mph), which is typical for these type of crop production and protection material applications.

Testing Methods

This testing will gather information and data for evaluating the applicability of the pesticide spray DRT protocol for successfully testing commercially ready pesticide spray DRT nozzles. All high speed tests were conducted in the USDA-ARS wind tunnel located in College Station, Texas. Three test nozzles and a reference nozzle were tested using the pesticide spray DRT protocol. The three test nozzles were a Hypro ULD 120-04 nozzle, a Teejet AI-110 VS nozzle and a CP11TT 4008 Flat Fan nozzle. The nozzle used to define the Fine/Medium boundary in the ASABE Standard was selected as the reference nozzle. Specifically,

Drift Reduction (%)[1]	25 ≤ 50	50 ≤ 75	75 ≤ 90	90 ≤ 95	95 ≤ 99	≥ 99
LERAP Drift Classification	*	**	***	***	***	***
ISO Drift Classification	F	E	D	C	B	A

[1] Drift reduction is the percentage of drift reduction achieved by a technology as compared to a standard reference.

TABLE 1. Drift reduction classification for the LERAP and ISO system based on percentage reduction of candidate system as compared to reference system.

this reference nozzle was a Spraying Systems 110° Flat fan nozzle with an #03 orifice operated at 43 psi.

Modeling Inputs and Setup

Computer models are typically very sensitive to the input variables and AGDISP (Agricultural Dispersion model) is not different. AGDISP Ver. 8.21 was used in the modeling scenarios with the following inputs standard across all scenarios reported in this manuscript:

- **Aircraft:** Air Tractor AT-401 with 66 ft swath width
- **Application Scenario:** 11.5 ft release height with 10 spray applications moving upwind
- **Meteorological Conditions:** Wind Speed: 5 mph @ 90° (crosswind), Temperature: 80°F, Relative Humidity: 70 percent

Based on the droplet size measurements from each of the nozzle evaluations, the corresponding droplet size data were input into the AGDISP model. One of the default settings in the AGDISP model is a swath offset of 0. The effects of changing this offset from 0 to a ½ swath offset were modeled. As noted previously, the practice of using ½ to 1 full swath offset is a common BMP that aerial applicators use during spray applications.

How are DRT's Rated?

The two most commonly used drift reduction classification systems are the Local Environmental Risk Assessment for Pesticide (LERAP) and the International Standards Organization (ISO) systems. The LERAP system uses a system of stars (No stars to ***) to denote the level of drift reduction that a given technology provides as compared to a reference system. The ratings may be used to determine the size of the spray buffer mitigation the applicator can use with a given spray technology. The ISO drift reduction standard defines the six drift reduction classes ranked alphabetically (A-F) with the A class having the greatest percentage reduction and the F class the least (Table 1). The ISO classification is also used as a method to mitigate the size of a no-spray buffer area. Unlike the ISO classification system, the LERAP method groups systems with a 75 percent reduction or greater into a single classification group.

Results

As expected, the droplet size decreased for each of the nozzles as the airspeed in the wind tunnel increased from 120 mph to 140 mph. The droplet sizes also increased with N1 and N2 when the spray pressure was increased from 30 to 60 psi. These data were used in all of the subsequent AGDISP modeling work.

Modeling Application Efficiency

After running AGDISP using the droplet size measurements for the different testing scenarios (nozzle, pressure, airspeed), the modeling outputs were recorded. Application efficiency is the amount of spray material, expressed as a percentage of spray released from the simulated aircraft, that deposits in the field or targeted area. For all of the simulations, downwind deposition out to 30 ft was modeled. This is representative of the spray deposition from the edge of the swath to a distance 30 ft downwind. The airborne drift at 10 m represents the portion of the spray volume that remains in the air at this distance. The reference nozzle generated an application efficiency of 86.7 percent with 1.5% of the spray in the air 30 ft from the field boundary in the 120 mph modeling runs. The three nozzles (N1,

Spray nozzles are positioned at the outlet of the high speed wind tunnel, which can generate airspeeds up to 220 mph. The spray droplets are measured about 20 inches downstream with a laser droplet sizing instrument (red and silver instrument in the background).

N2 and N3) tested all had improved application efficiencies (90–92 percent) and large decreases in airborne drift as compared to the reference nozzle. In the 140 mph tests, the Reference nozzle had an application efficiency of 84.6% and 2.45% of the spray was still airborne at 30 ft from the downwind edge of the field. The three nozzles tested all had improved application efficiencies (87–90 percent) and decreases in airborne drift.

Drift Reduction from Nozzles

Drift reduction is defined as the reduction in the airborne portion of the spray as compared to a reference (ISO Standard). The test nozzles reduced airborne spray drift by 70–84 percent in the 120 mph airstreams and from 41–74 percent in the 140 mph airstream tests. At the lower airspeed, the tested nozzles received E and D ratings based on the ISO drift classification scheme and ** and *** based on the LERAP scheme. At 140 mph, the test nozzles received F and E ratings based on the ISO drift classification scheme and * and ** based on the LERAP scheme.

Effects of Swath Offset on Application Efficiency and Drift Reduction

All of the previous scenarios were rerun with a ½ swath offset except the reference nozzle settings. A ½ swath offset was the equivalent of making a spray application 33 ft further upwind from the field edge. For both of the airspeeds, the three nozzles combined with a ½ swath offset resulted in application efficiencies between 93–97 percent and only minor changes in the airborne drift percentages. The offset results in more material depositing in the field, which is why aerial applicators have adopted this practice.

Conclusions

This work examined a drift reduction testing protocol comparing three different nozzles to a reference nozzle. Additionally, an industry Best Management Practice (BMP) of offsetting near field edge spray swaths was examined. The techniques and procedures for determining the nozzle effects on spray droplet size under high-speed air-sheer showed distinct differences between the nozzles tested and the reference nozzle. Using the AGDISP model, these droplet size results were translated to estimates of downwind deposition and airborne drift as a means of comparing the relative efficiencies of each nozzle as compared to the reference nozzle under different airspeeds and pressures. When compared to the reference nozzle, the results showed that:

- The three spray nozzles reduced spray drift potential by 40–84 percent due mainly to the larger $D_{V0.5}$ values, which were 30–80 microns (µm) larger than the $D_{V0.5}$ for the reference nozzle.
- After modeling the aerial application industry's Best Management Practices (BMP) of ½ swath offset, the results showed further increases in drift reduction and large increases application efficiency with application efficiencies ranging from 93–97 percent.
- The combination of multiple drift reduction techniques/technologies can greatly reduce spray drift. ■

Defining Professionalism

By the California Agricultural Aircraft Association

Over the years, CAAA has developed many programs to promote the professionalism of the industry. We have used this to differentiate ourselves from others and to protect the future of the industry. But what does this truly mean? Let's explore what professionalism means to California's aerial application industry.

Definition of Professional:

Having the skill, competence or character expected of a member of a highly trained profession

Early in CAAA's history, members realized that to combat onerous legislation and regulation the industry had to create professional standards of application. In the 1950s, the first Code of Ethics was drafted. Creating standards that members could adhere to was the first step in distinguishing the professional aerial applicator from "renegades" that threatened the future of the industry.

More programs followed including pilot training/safety, deposition testing and the Professional Standards educational videos. All of these programs sought to raise the level of expertise of aerial applicators. Some embraced these programs while others saw the programs as hindrances. What these individuals failed to understand was that these programs were working to protect their financial futures. Without these programs, industry lacked justification to oppose legislation that would ultimately minimize the ability for all aerial applicators to operate in California.

For those who led these efforts, we should give heartfelt thanks. Change is inevitable and these individuals intuitively knew that for the industry to prosper, it must be proactive. It is easy to understand how the industry developed technologically but more difficult to see why an industry would promote continuing education for license renewals. Even now, we have members that rail against the bureaucracy that this has created. However, I challenge you to consider the consequences of not requiring continuing education in our current social environment. Recertification is a cornerstone of our professional stature—one of the facts we use to stand up against potential legislation that threatens the industry, such as recent [California] bills AB 622 and AB 1721. These bills would have negatively impacted aerial application by placing extensive and unwarranted buffer zones. We successfully stopped these bills by highlighting our professionalism and certification programs.

While a professional is someone with specialized skills or training, professionalism combines the educational and skill level components with character and attitude. While one can be a highly trained professional, he portrays his professionalism through his conduct. This includes interaction with peers, customers, employees/employer and his community. To quote an old adage, "He doesn't just talk the talk, he walks the walk."

Many CAAA members portray this trait daily. They are active in their communities, reaching out to educate and answer questions about their industry. When they have concerned citizens, they make calls prior to applications to notify and schedule applications when it is least intrusive. They review recommendations and schedule jobs during appropriate application conditions, effectively minimizing the potential for off-target movement. If application conditions

change during the application, they stop the application and reschedule it when the right condition exists.

Additionally, they know that not all applications are appropriate for aerial services. If conditions are not appropriate, they refuse the work. While this may impact their profit margins, these professionals know what is in the best interest of the industry. They appreciate that any off-target application affects not only their economic future but the future of the industry.

These professional individuals are also willing to mentor new pilots. They share the challenges of the industry and describe the skills and attitude necessary for the job. They are actively recruiting our next generation, while realizing that not all are suited for this profession. When training new pilots, they realize there is no substitute for experience. They have well-prepared training plans and don't allow pilots to advance if they are not ready for the next level of training. They carefully monitor this training and don't allow pilots to perform maneuvers or applications that they are not prepared for which could cause unintended consequences such as drift or downed aircraft. Displaying true professionalism, they guide these ag

Ethical Questions

NAAREF explored how ethics relate to the ag aviation industry during the new ethics module it introduced for the 2010–2011 PAASS Program.

You flew the wrong field—*Do you tell anyone?*
The hour meter stopped working—*When do you fix it?*
You are selling a damaged aircraft—*Do you give full disclosure?*

pilots through extensive training and learning processes to develop the next generation of professional ag pilots.

Professionals push themselves to continually challenge themselves. They are innovators using the latest technology to improve the quality of the service or product they offer. They attend meetings and conventions to receive the most recent information and quiz those who have experience with the equipment. These leaders also understand the importance of equipment maintenance both from a safety and productivity standpoint.

How do you illustrate your professionalism?

When soliciting new customers, do you focus on promoting the quality of the services you offer or do you spend your time bad-mouthing your competition? When selling your services, you are promoting the value you provide your customer. But when all you provide is unconstructive information and speak poorly about your competition, the customer may wonder what you truly believe about them. Do you truly value the business relationship with your customer or is the sale just a means to boost your revenues? If the latter is true, why would they be loyal to you when one of your competitors solicits their business? Using positive sales techniques is how you portray your professionalism.

Additionally, bad-mouthing the competition creates a negative image of the industry and damages its professional credibility.

Do you ensure that your employees/associates have the proper skills, equipment and knowledge to safely do their jobs? True professionals realize that there is little they can accomplish themselves; they rely on those around them to help them succeed. They provide the equipment and knowledge to safely perform their tasks.

Do you charge appropriately? Every operator has different overhead costs that must be factored into the per-acre rate. Are you assigning adequate costs to cover your maintenance and making allowances for unseen events? Shortchanging your maintenance activities is a poor business decision that affects the safety of your pilots and your ability to provide services to your customers. Proper maintenance is much more affordable than leasing additional equipment and rebuilding an aircraft in the event of an engine failure. Will the application likely require a return to the field for trim passes? Are you building adequate reserves in the event of a down commodity year?

Failure to consider these factors when pricing may pressure operators and pilots to "push" application windows. You are doing a disservice to your customers, employees and your future finances if you don't factor all costs into your pricing schedule. Remember, professionalism combines having competence and skills with character and attitude. It is easy just to charge "whatever it takes" to get a job, but if you are in this industry for the long haul you must make sound business decisions to ensure your future fiscal viability and that of your business.

While a professional is someone with specialized skills or training, professionalism combines the educational and skill level components with character and attitude.

All of our CAAA members portray professionalism in one manner or another. The real challenge is to project professionalism at all times. Ultimately, we are all in this together. ■

Reprinted with permission from the California Agricultural Aircraft Association. This article originally appeared in On The Deck, CAAA's official publication.

Aerial Application Liability Coverages

By Tim Bonnell Jr.
NAAA Insurance Committee

When an agricultural aviation operator gets an angry call from a farmer, the last thing he wants is to worry about whether he has the proper liability coverage for the potential loss. There are different types of liability coverage available so it is essential to understand which coverages are on your policy. This article will outline the basic types of liability coverages, some of the key exclusions and several available endorsements for an agricultural aviation insurance policy.

Liability is the condition of being legally liable to a third party for damages caused in whole or in part by you. Insurance policies respond in two ways when you become legally liable: 1) the policy pays the damages you are legally obligated to pay up to the coverage limit, and 2) the insurer provides a legal defense, until the limits of liability are exhausted. The legal defense costs are separate from the liability limits in agricultural aviation policies and can often incur much higher expenses than paying the actual claim.

There are two basic types of liability coverage on an agricultural aviation insurance aircraft policy: 1) **Non-Chemical (Aircraft) Liability**, for third-party bodily injury and property damage not by chemical application, and 2) **Chemical Liability** for damage resulting from the aerial application or chemicals. Many refer to Chemical Liability in slang as "drift insurance." Chemical Liability has several options and unique exclusions.

The three chemical liability category options:

1. **Comprehensive Chemical "CC"**—provides coverage for liability incurred out of the aerial application of seeds, fertilizers or any chemical except Picloram.* (some policies also add after "except Picloram," "or any defoliant or desiccants applied in dust form; or any inorganic arsenical compound, except arsenic acid used in liquid spray form as a cotton desiccant or defoliant.")
2. **Restricted Chemical "RC"**—provides coverage for liability incurred out of the aerial application of seeds, fertilizers, insecticides or fungicides only (sometimes rodenticides are also included in the RC definitions).
3. **Excluding Chemical "XC"**—provides coverage for liability incurred out of the aerial application of seeds and fertilizers only.

*Operators can purchase a write-back endorsement providing coverage for liability incurred out of the aerial application of **Picloram** (Tordon, Grazon).

These three categories of chemical liability on an unendorsed policy apply to claims arising out of the aerial application to a property not owned by you or the person for whom you are spraying. For example, if you are spraying a

wheat field for Farmer A and cause drift damage to Farmer B's field, then the policy will provide coverage for the damage to Farmer B. However, if you spray the wrong field (Target Crop) for Farmer A, apply the wrong chemical to the target field (Target Crop) or cause drift damage to another field owned by Farmer A (Adjacent Fields) there is no coverage in the unendorsed policy. To cover these exposures the policy needs to have the **Target Crop (also known as Crops Worked Upon, and Crops Being Treated)** and **Adjacent Fields** endorsements. These can be separately purchased, but if you purchase the Target Crop coverage the Adjacent Fields is generally included.

Example

FARMER A Field 1 Wheat (Target Crop)	FARMER B Field 1 Wheat (Chemical Liability)
FARMER A Field 2 Soybeans (Adjacent Fields)	FARMER B Field 2 Wheat (Chemical Liability)

In some situations a farmer or contract issuer will require the operator to name them as an additional insured to the operator's insurance policy. A **Farmer, Owner, Grower** endorsement is available to satisfy this requirement. This is not recommended unless it is required since the operator is sharing the same limit of liability with the additional insured. Since separate limits are not provided for each insured adding an additional insured dilutes the coverage.

Some other key exclusions and endorsements to note include the following:

- **EXCLUSION:** There is no coverage for any claims arising out of the aerial application to rights-of-way or easements for public or quasi-public persons or bodies, waterways, railroads, pipelines or utility companies. **ENDORSEMENT:** A **Rights-Of-Way** write-back endorsement is available to be added to a policy.
- **EXCLUSION:** There is no coverage for any claims arising out of the aerial application to any residential area. **ENDORSEMENT:** A **Residential Areas** write-back endorsement is available to be added to a policy. In general, this is important with mosquito and gypsy moth control applications.
- **EXCLUSION:** There is no coverage for any claims while the aircraft is used for smoke or fire patrol, fire fighting or control or any activity in support of those uses. **ENDORSEMENT:** Several **Wildfire Control**, **Fire Fighting** and **Fire Patrol** endorsements are available.
- **EXCLUSION:** There is no coverage for any claims arising out of the aerial application of herbicides or Glyphosate to forests, woods, timberlands or tree farms. **ENDORSEMENT:** A write-back endorsement may be permitted in certain situations.
- **EXCLUSION:** There is no coverage if the aircraft is leased, rented or loaned to anyone other than the Named Insured.
- **EXCLUSION:** There is no coverage for any claims arising out of the aerial application involving

two or more aircraft owned or operated by the Named Insured, unless all aircraft involved in the same occurrence are insured by the same insurance company for the same Chemical Category.

- **EXCLUSION:** There is no coverage for any type of pollution, including noise and environmental. **ENDORSEMENT:** Separate **Environmental Pollution Liability** policies are available.
- **EXCLUSION:** There is no coverage for any claims that are designed to be covered by **Workers' Compensation**.

A few insurance companies may limit the coverage territory for chemical applications to the state of domicile and adjacent states. Operators that spray outside this territory should have the policy endorsed (if necessary) to include any other states in which they spray.

There are minimum limits of liability required by most states. However, the most common limits on aerial application policies are $100,000 each person, $300,000 each occurrence for bodily injury and $100,000 each occurrence for property damage. These limits apply to both Non-Chemical (Aircraft) Liability and Chemical Liability. There are higher and lower limits available in many circumstances. Chemical Liability limits of $300,000 each occurrence (and potentially higher) may be available in many situations. Non-Chemical (Aircraft) Liability limits of $500,000 and $1,000,000 each occurrence are often purchased to satisfy contracts. Most policies will have aggregate (total) limits for bodily injury and property damage on the policy. These aggregate limits may vary by policy (often depending on how many aircraft are on a policy) so it's important to make sure you know your aggregate limit.

While this information gives you some of the basic information about agricultural aviation liability coverage, by no means does it cover every detail, coverage and exclusion of the policy. As always, please ready your policy. There are other liability policies not discussed here that your operation may need, such as General Liability and other business liability policies. Please visit with you aviation insurance agent to make sure you have the proper coverages to meet your operation's needs. ■

Is there an insurance matter you would like to learn more about or think would be of interest to Agricultural Aviation's readers? The NAAA Insurance Committee welcomes your suggestions. Please send insurance article ideas to information@agaviation.org.

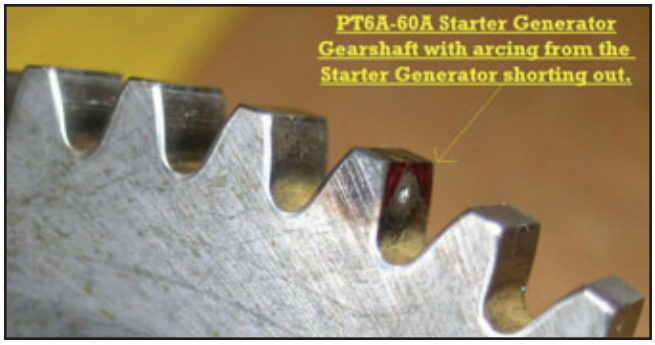
PT6 Maintenance Tips: Starter-Generator Events

By Fletcher Sharp
Covington Aircraft

Over the past 40 plus years, there has been a very small number of # 1 bearing failures on PT6 series engines, perhaps on the order of two or maybe three events annually. A # 1 bearing failure is almost always a very catastrophic event from the engine's perspective. The # 1 bearing supports the rear of the spinning compressor and compressor turbine disk assembly, so when this bearing fails, it allows all of the rotating mass comprised of the compressor hubs and blades, plus the compressor turbine wheel assembly to start rotating out of the normal plane of rotation. That means all those parts that are spinning at well over 34,000 rpm start to bump into stationary parts. The end result is a very quick, noisy and extremely expensive sudden engine stoppage/shutdown. All the broken parts continue downstream and out the exhaust, pretty much wiping out the entire engine.

One of the possibilities that can cause a # 1 bearing failure is a starter-generator problem. If you have ever experienced a "no start/no rotation" event when you selected the starter switch, the odds of your engine receiving an electrical shock are very high. Same thing applies for a very slow rotational speed of less than 6 to 8 percent Ng, or N1. Most operators just replace their starter-generator with another one and press on working. That is most likely a very poor choice!

When a starter-generator gets some time built up, the possibility of armature bearing wear or carbon buildup inside the starter-generator can allow the armature to short directly to the casing and the starter-generator drive gear. That short can be on the order of hundreds, if not well over a thousand amperes of current to momentarily flow from the starter-generator drive shaft into the starter-generator gear shaft inside the AGB (Accessory Gear Box), which is in direct mechanical contact with the high speed input shaft to the compressor. This input shaft passes directly through the # 1 bearing, thus providing a direct path to this bearing. That allows the # 1 bearing to become magnetized, which allows it to capture ALL of the ferrous debris not caught by the engine oil filter, thus eventually bringing on the failure of the # 1 bearing. (See accompanying photos)



If you have a no-start event, contact your engine maintenance shop and have them check your engine's AGB and starter-generator with a gauss meter, which checks for magnetism. A fairly decent gauss meter can be purchased for under $100. Another use for a gauss meter is to check for magnetism on the front of the engine, at the prop shaft if you have a wire strike.

If this AGB/starter check shows heavy magnetism, then a disassembly of the AGB is in order to check for further damage/distress. It's much cheaper to do this preventative maintenance than just pressing on and having to pay for a catastrophic repair. Most engines suffering a # 1 bearing failure are not even economical to repair! You will have to purchase a replacement engine.

There is some preventive maintenance that operators can carry out on their own. At each 100-hour inspection, with the brush access band removed, and using shop air pressure, blow out all of the dry carbon residue from the brushes, or as much of the carbon dust as you can. At the annual inspection, completely remove the starter-generator from the engine following the procedures in the applicable PT6A maintenance manual. With the brush band access removed, blow through the starter-generator from the front to the rear to keep the armature as clean as possible.

The typical starter-generator life is 1,000 hours; don't try to squeeze extra usage out of your starter. Get it overhauled at the appropriate time interval. Make certain the shop you're using for starter-generator overhauls is a reputable shop; you can check around with other operators to find out which shops seem to be doing good, reputable work, and use one of those shops.

Keep the starter-generator as clean as possible of carbon from the brushes.

For those larger PT6A powered ag aircraft that have at least two 24-volt batteries, give serious consideration to having one of the "Cool Start" type relay kits installed. This definitely helps get the engine started quicker and cooler, especially if the engine has only been shut down for less than an hour and is still warm. The Cool Start kit is most effective on the larger PT6A series, from the PT6A-45 series and larger engines (PT6A-60AG, -65AG & -67AG). We probably should also add the PT6A-67F on the largest AG aircraft. Although this "Cool Start" kit allows the starter to spool up the engine using 48 volts instead of 24 volts, there is no evidence to date that shows any shortened starter-generator life.

Note: For those operators using smaller PT6A engines, Cool Start type kits still have benefits, but they are not as obvious, nor as necessary. If your aircraft only has one 24-volt battery, then you would not be able to install this kit. The aircraft must have two or more 24-volt batteries for the Cool Start type kits to work.

The photos seen on the adjacent page show the arcing on the high speed input shaft spline, which leads directly to the # 1 bearing area and the same arcing inside the AGB power train on the starter-generator gear shaft. Note that only one tooth carries the arcing mark, so one has to be thorough with inspections! ■

Fuel for Thought

Develop a Safety Procedure for Hot Loading/Fueling

By Ken Degg
NAAA Director of Safety & Education

On Nov. 23, 2010, the FAA issued Safety Alert for Operators (SAFO) 10020 on the subject of hot fueling and loading of aircraft conducting operations under 14 CFR Parts 91, 133, and 137. Hot fueling and loading in the aerial application industry involves both fueling and loading the hopper while the aircraft's engine is operating. The FAA issued this SAFO in response to several fires and accidents that have occurred as a result of engaging in hot servicing.

The incident that brought this issue to the forefront was a March 30, 2009, refueling fire in which a Bell 47G-2A was consumed by fire while conducting ag operations. According to reports received by NAAA, the ground man put the fuel hose into the tank and locked the nozzle in the open position. Fuel flow was blocked to the tank by a kinked hose and the ground man left the aircraft to rectify the problem. When the hose was straightened and fuel began to flow, the pressure caused the nozzle to come out of the filler neck and spray fuel on the engine and the pilot in the cockpit. A fire started which resulted in destruction of the helicopter and serious burns to the pilot.

The FAA responded by issuing a SAFO to encourage operators using hot fueling and loading to examine their procedures and formulate safety practices. The FAA and NAAA agree that establishing a written standard operating procedure (SOP) will cause operators to consider each portion of the operation with a critical eye while writing the guidelines.

The SAFO recommends not hot fueling or loading an aircraft except when it is absolutely necessary due to the nature of the operation. If and when this practice must be carried out, operators should follow a previously developed SOP for use by both flight and ground personnel. The FAA addresses certain safety concerns in the SAFO and therefore your SOP should address at least those.

FAA recommends hot fueling only with JET A or JET A-1 fuel types. If strict operating procedures are not followed, hot fueling with AvGas can be more hazardous because of the fuel's lower flash point. Aircraft being fueled should have all potential ignition sources located above the fuel inlet ports and above the fuel vent

Hot fueling and loading in the aerial application industry involves both fueling and loading the hopper while the aircraft's engine is operating.

or tank openings. These sources may include engines, exhausts, auxiliary power units (APU) and combustion-type heater exhausts.

An appropriately rated pilot should be at the controls during hot fueling or loading. Seat restraints should be unbuckled in case a hasty exit is required.

Only designated people with the proper training should operate the fueling or loading equipment.

Two ground personnel should be present during the operation—one at the aircraft and one at the emergency shutoff for the equipment.

When the servicing operation is completed, ensure that seatbelt and shoulder harness are re-secured prior to aircraft movement.

The information in this SAFO should be included in initial and recurrent training programs for pilots and ground personnel.

The FAA's stated purpose for a SAFO is to present safety information to aircraft operators for their consideration and use. Within the defined use of the document is this statement: Besides the specific action recommended in a SAFO, an alternative action may be as effective in addressing the safety issue named in the SAFO. NAAA encourages all operators to develop a written procedure for the safe loading of either fuel or hopper material while the engine is operating. Address each of the listed concerns and any others that you might find in your operation. For example, one operational requirement for hot fueling may be the use of a single point fuel system. Once these procedures are developed, be certain to train pilots and ground personnel in their implementation and continued use.

The SAFO is available on NAAA's website at www.agaviation.org/content/safo-10020-hot-servicing. ■

NAAA encourages all operators to develop a written procedure for the safe loading of either fuel or hopper material while the engine is operating.

Before fueling, the aircraft must be bonded to the fuel source to equalize static electricity.

All doors, windows and access points allowing entry to the interior of the aircraft near the fuel inlet ports should be closed.

Fuel should be dispensed into an open port (filler) only from approved dead-man nozzles, which must be manually held in an open position. The flow rate should not exceed 10 gallons per minute. Close port (single point) pressure fueling ports are preferable because the potential for spillage is reduced.

A fire extinguisher of the appropriate type and size should be within easy reach of ground personnel during hot fueling operations. If possible, a fire extinguisher should also be installed in the cockpit of the aircraft.

More Lessons from the 2010 ASABE/NAAA Technical Session

There's no one-size-fits-all approach to aerial application, but, fittingly, field research yields plenty of applicable information for aerial applicators

By Scott Bretthauer, Ph.D.
University of Illinois, Application Technology Extension Specialist

This is a continuation of the research project summaries from the American Society of Agricultural and Biological Engineers (ASABE) Technical Session at NAAA's 2010 Annual Convention & Exposition in Savannah, Ga. Part 1 appeared in the January/February issue.

Factors Affecting Droplet Size, Coverage, and Weed Control with Sharpen Herbicide

Authors: Fellows, G., Barbosa, R.N., Vidrine, R., Rhodes, A.
Presenter: Gary Fellows

Sharpen is a contact herbicide from BASF with limited mobility. Good coverage is critical when applying Sharpen. It needs good contact with growing points and leaf area in order to be effective. Efficacy is determined by ACTT—Adjuvant (MSO @1 pint/acre and UAN/AMS) + Coverage (3 GPA minimum by air) + Tank-mix (glyphosate) + Timing (weeds < 6 inches in height). In order to maximize effectiveness, BASF and Louisiana State University AgCenter evaluated aerial applications with Sharpen to determine how to achieve the best coverage. They compared six treatments for droplet size and distribution using the USDA-ARS Aerial Spray Nozzle Models, fly-in testing with water and a field trial in wheat stubble with Sharpen herbicide and glyphosate, where they also evaluated weed control. The six treatments included three nozzle and spray volume combinations using CP-09 nozzles: 3 GPA with straight stream setting, 3 GPA with 30-degree deflection and 5 GPA with 30-degree deflection. For each of these, Sharpen rates of 0.5 fl oz per acre and 1 fl oz per acre were tested. The nozzle models predicted a smaller droplet size than measured during fly-in and


2010 ASAE/NAAA Technical Session Program

Savannah, GA

December 6-9, 2010

<Select TITLE for Abstract, Presentation, and Full-text Paper>

ROLE OF AIR INDUCTION NOZZLES IN HIGH SPEED AIRSTREAMS
by
Clint Hoffmann, B. Fritz, Y. Lan

ATOMIZATION OF AERIAL SPRAY NOZZLES AT AIRSPEEDS ABOVE 160 MPH
By
Brad Fritz, C. Hoffmann

A REVERSE VENTURI ATOMIZATION CHAMBER
By
Russ Stocker

FUSION OF SENSED DATA FROM AIRBORNE AND GROUND-BASED SENSORS FOR COTTON REGROWTH
By
H. Zhang, Yubin Lan, C Suh, J. Westbrook, C. Hoffmann, R. Lacey

TEMPORAL INDICATIONS OF ATMOSPHERIC STABILITY AFFECTING OFF-TARGET SPRAY DRIFT IN THE MID-SOUTH U.S.
By
S. Thomson, Y Huang, Brad Fritz

SPRAY TABLE EVALUATION OF MITICIDES FOR TWO-SPOTTED SPIDER MITES ON COTTON
By
Dan Martin, J. Lopez, Y. Lan

FACTORS AFFECTING DROPLET SIZE, COVERAGE, AND WEED CONTROL WITH SHARPEN HERBICIDE
By
Gary Fellows, R. Barbosa, R. Vidrine, A. Rhodes

USING PHOTOGRAPHY TO AID IN ANALYZING AIRPLANE SPRAY PATTERNS AT OPERATION S.A.F.E. WORKSHOPS
By
Robert Wolf, S. Bretthauer, P. Newby

AUTOMATING SOME MEASUREMENTS DURING OPERATION S.A.F.E. WORKSHOPS
By
Roberto Barbosa, Y. Chui

LOW VOLUME FUNGICIDE APPLICATIONS TO CORN
By
Scott Bretthauer, R. Wolf

EVALUATION OF ADJUVANTS TO DETERMINE EFFECT ON DROPLET SIZE AND POTENTIAL USE AS "ANTI-EVAPORANTS" AS SUBSTITUTES FOR CROP OIL
By
Alan McCraken

For information on the American Society of Agricultural Engineers, click below:

For more information on any of the ASABE technical presentations at NAAA's 2010 Convention, visit http://apmru.usda.gov/downloads/downloads.htm. The authors' presentations and research papers are available for download.

field testing. Sharpen did not alter the droplet size much compared to water only. The 30-degree deflection reduced droplet size and increased coverage compared to the straight stream setting. With the 30-degree deflection, 5 GPA provided higher coverage than 3 GPA.

TAKEAWAY:
Droplet size decreased and coverage increased as deflection was increased from straight stream to 30-degree deflection.

Automating Some Measurements During Operation S.A.F.E. Workshops

Authors: Barbosa, R.N., Chiu, Y.J.
Presenter: Roberto Barbosa

Operation S.A.F.E. fly-ins require numerous people to handle the various duties at a fly-in. Some of these duties include measuring important things on the flightline, including aircraft speed, aircraft height and the weather conditions. The current method of measuring height involves the use of scopes and the concept of similar triangles. Speed is measured with a hand-held radar gun. A common problem at a fly-in is to not have enough experienced people to help collect this data. In an effort to reduce the amount of help required, engineers from Louisiana State University (LSU) are designing equipment to automate some of the flightline measurements. The LSU team built a wireless system that transmits measurements to a data collector, which also records the data for future reference if needed. The system uses a LaserAce to measure spray release height and a Stalker radar speed sensor to measure aircraft speed. The system was tested at the Colorado fly-in in September 2010. Measurements from the new system were compared to measurements from the standard fly-in equipment and found to be reliable.

TAKEAWAY: **A new equipment system for Operation S.A.F.E. fly-ins automates aircraft speed and spray release height measurements.**

Low Volume Fungicide Applications to Corn

Authors: Bretthauer, S., Wolf, R., Thomas, D., Hoffmann, W. C., Fritz, B.K., Schertz, S.
Presenter: Scott Bretthauer

This was a two-year project involving Syngenta, which funded the research, University of Illinois, Kansas State University, USDA-ARS and Schertz Aerial Service. The various treatments examined included spray volumes of 2, 1 and 0.5 GPA, flat fan nozzles and rotary atomizers, the use of crop oil concentrate (COC) and non-ionic surfactant (NIS), and several fungicides. Treatments were evaluated for deposition, coverage in various parts of the canopy, droplet size, yield and disease severity. At all volumes, the use of COC improved deposition and coverage. The degree of improvement

increased at lower volumes, particularly at 0.5 GPA. In 2009, 2 GPA with Quilt Xcel and COC had higher deposition than 1 GPA with Quilt Xcel and COC but there were no differences in yield. In 2010, 1 GPA with Quilt Xcel and COC had higher deposition than 2 GPA Quilt Xcel with no COC, 2 GPA with Headline AMP and NIS, and 0.5 GPA with Quilt Xcel and COC. There were no big differences in yield, but the 0.5 GPA with Quilt Xcel and COC did have a lower yield than most of the other treatments. At 1 GPA with no COC, the rotary atomizers had higher deposition than the flat fan nozzles. Yield results were the opposite. For 1 GPA with COC, the flat fan nozzles had higher deposition but the yield was the same. Flat fan nozzles had slightly higher deposition than rotary atomizers at 0.5 GPA with COC, but the rotary atomizers provided higher yield. The size of the spray droplets that deposited in the canopy was smaller for the rotary atomizers than the flat fan nozzles.

TAKEAWAY: **Aerial fungicide applications to corn are possible at volumes lower than 2 GPA but nozzle selection and setup are critical to success. The use of COC improves canopy deposition for low volume applications.**

Evaluation of Adjuvants to Determine Effect on Droplet Size and Potential Use as "Anti-evaporants" as Substitutes for Crop Oil

Authors: McCracken, A., Escalas, V.
Presenter: Alan McCracken

Every time a product is added to a spray tank, the droplet size is changed. The goal of this project was to evaluate adjuvants to determine how they change the droplet size and how they function as anti-evaporants. Reducing evaporation of spray droplets can increase deposition in the plant canopy. Preliminary tests of two adjuvants, Speedwet and Nimbus oil, were carried out in Argentina using an ultra low volume controlled droplet applicator. These two adjuvants controlled evaporation and reduced droplet size compared to water only. Further testing was carried out on a variety of aircraft using a variety of nozzle types. The spray volume ranged from 0.3 to 1.2 GPA. Testing was also done to compare how water sensitive paper orientation—horizontal, 45 degrees and vertical—affects collection efficiency. This testing with various nozzle types revealed that the products did increase deposition by reducing droplet loss through evaporation. The adjuvants' impact on droplet size varied depending on nozzle type and setup, but in general they tended to reduce the variation in droplet size created by the nozzle. Cards oriented at 45 degrees had the highest collection efficiency.

TAKEAWAY: **Adjuvants can increase deposition on the target by reducing evaporation of spray droplets. These adjuvants also change the droplet size.**

Final Takeaway

Hopefully these summaries have provided you with information you can use in your aerial application business. The ASABE Technical Session is held at NAAA's Annual Convention & Exposition so that researchers can share their findings with aerial applicators, making sure they can take advantage of the latest information.

If you have any questions or suggestions about any of the projects summarized in these two articles, I encourage you to contact the authors to discuss the research further. Additional information about this and previous years' ASABE presentations is available at http://apmru.usda.gov/downloads/downloads.htm. Abstracts, manuscripts, PowerPoint presentations and the presenting author's contact information should be available for all of the technical papers presented. I also hope to see you at the next ASABE Technical Session during the 2011 NAAA Convention & Exposition in Las Vegas. ■

Hemisphere GPS

On-Board Mapping

Fly right with customized maps from Hemisphere GPS!

Improves flight navigation and confidence

Street maps or sectional maps available

View flight information on background maps

Auto upload into CPU

Download via web site

www.hemispheregps.com • air@hemispheregps.com

2010–2011 NAAREF Program Sponsors

Operators and Pilots, Federal and State Agencies, Insurance and Service Providers, Aircraft and Equipment Manufacturers, Chemical Companies, Academic Institutions and State Associations sponsor NAAREF projects, including the PAASS Program. Donations are at the category level unless individually noted. **Donors that have pledged for 3 to 5 years or have donated the last 3 years at that level are shown in bold print.**

STS Enterprise $50,000
National Agricultural Aviation Association

F-22 Raptor $40,000
Federal Aviation Administration ($47,500)

P-51 Mustang $25,000
BASF Corporation

P-40 Warhawk $15,000
Syngenta

Spirit of St. Louis $10,000
Air Tractor Inc.
Bayer Crop Science
Pratt & Whitney Canada

Sikorsky R-4 Hoverfly $5,000
Thrush Aircraft Inc. ($5,500)
Covington Aircraft Engines Inc.
DuPont Crop Protection
Professional Aviation Risk Management Association
Ron Deck Memorial by Sky-Tractor Supply Co.

Curtiss Jenny $1,000
Chartis Aerospace Insurance Services Inc. ($2,000)
New Mexico AAA ($2,000)
Texas AAA ($2,000)
Alabama AAA
Chanay Aircraft Services Inc.
CP Products Company Inc.
Garrco Products Inc.
Gomes Farm Air Service Inc.
Growers Air Service
H&P Flying Service
M M Satterfield Aviation Fuels
Andrew, Kristen & Benjamin Moore
O'Brien Flying Service Inc.
Schertz Aerial Service Inc.
Starr Aviation Agency

Piper J-3 $500
Jones Flying Service ($750)
Agriflite Service Inc.
Allianz
B&S Flyers Inc.
Bunkie Flying Service Inc.
Colorado AAA
Harley Curless
Double L Flying Service
Goodman Flying Service
Helicopter Applicators Inc.
Monticello Flying Service Inc.
Stokes Flying Service
Thomas Helicopters Inc.
Tulsa Aircraft Engines
Lee & Nancy Turnquist
Western Helicopter Service Inc.

Graf Zeppelin $250
Yellowstone Air Service Inc. ($280)
Matt Crabbe ($267)
Bell Flying Inc.
Bernard "Marty" Brill
Carroll Flying Service Inc.
Crop Air Inc.
Everett Flying Service Inc.
K & P Flying Service
Medina Flying Service
Kristina Orcutt
Plu's Flying Service Inc.
Precissi Flying Service
Richter Aviation Inc.
Rucker Flying Service Inc.
Jayne Rucker
Women of the Louisiana AAA

Daedalus $100
Burnett Aviation Inc. ($200)
Richter Aviation Inc. ($200)
Thomas "Jim" Avery ($150)
Flagler Aerial Spraying Inc. ($150)
Hummingbirds ($150)
Rod Thomas ($150)
Aerial Crop Care Inc.
Aerial Crop Services LLC
Aerial Sprayers Inc.
Ag Air Inc./Frontier Helicopters
Agri Air Services
Air Capital Insurance LLC
American Ag Aviation Inc.
Arrow Aviation Inc.
Blair Air Service
Brignac Flying Service
Reid Brown
Boedeker Flying Service Inc.
Cady Aerial Spray
Central Valley Aviation Inc.
Allen Chorman & Son Inc.
Dixie Flying Service
FMC Corp.
Floyd Aero
Garland Aviation
Garrco Products Inc.
Glades Ag Service Inc.
Golden Ranch Aviation Inc.
Golden Wings Air Inc.
Heiderscheidt Aerial LLC
Robbie Howard
Jameson's Aero Ag
Kimmel Aviation Insurance Agency Inc.
Clyde Kornegay
Lakeland Dusters Aviation Inc.
Lewis Ag Aviation
Montana Aviation Trades Association
Mundell Enterprises
Nolan Ag Services Inc.
North Fork Helicopters Ltd.
Pioneer Flying Service
Probasco Flying Service
Professional Fiberglass
Quality Spraying Service
Racer's Ag Service
Roma Air Corp.
Sarita Aerial Contractors Inc.
Scott Aviation Inc.
Sherer Flying Service
Shelby Air Service Inc.
Douglas M. Smith
Russell Stocker
Richard M. Stoltz
Thiel Air Care Inc.
Blair Thompson
Trade Winds Ag Service
Tri-Me Spraying Service
Tri-Star Agrinautics
Williams Ag Service

Memorials presented to the PAASS Program

NAAREF and the PAASS Program express sympathy to all those who have lost loved ones or friends this past year. We are extremely grateful to those families who, during their time of grief, decided to request that memorial donations be made to the PAASS Program. Those memorials will be used in the production of our PAASS safety and educational program with the goal of preventing injury or death to those engaged in the aerial application industry.

David Jasma Memorial
by the North Dakota AAA

Ron Erickson Memorial
by the North Dakota AAA

Darrell Frey Memorial
by Mr. & Mrs. Dennie Stokes

Dave Bickle Memorial Fund

Stephen & Barbara Adams
Cecil & Tamara Anderson
Arapahoe Sheriff's Employee Fund
Brett's Spray Service
Stephanie & Ronald Bryant
Claudia Day
Laura Delong
Ren & Joanne Eastman
Kimber Eubanks
Helen Fenton
Heather Gallagher
Dana & Elaine Gustafson
Hardy Aviation Insurance Inc.
Ed & Jennifer Haselden
Adele Hause
Mr. & Mrs. Ed Klinkefus
Robert Kula
Sam & Dianne Macdonald
Carol & Paul Patterson
Pocahontas Iowa Airport
Bruce & Linda Ream
Donald Schick
Kyle Scott & Family
Richard & Karen Sheldon
Lois Sorensen
Terry & Melissa Ulven & Family
Thomas & Jeannette Ulven
Nancy Ulven
Jack & Wilma Weber
Dennis & Debbie Wernsman
Curtis & Tina Wirth

Ron Deck Memorial Fund

Al's Aerial Spraying LLC
Sky-Tractor Supply Co.
Mr. & Mrs. Dennie Stokes

Alan East Memorial Fund

Mr. & Mrs. Paul Abbott
Charlotte Abell
AgSur Aviones
Air Tractor Employees
Air Tractor Paint Shop 1 & 2
Tommy & Arlene Allen
Bailey Flying Service
Bonnie & Glenn Beavers
Benny White Flying Service
Breckenridge Bible Study Group
Mike Cobb
Conair Group
George Cossar Jr.
CP Products Company Inc.
James & Hicky Crouch
Harley Joe Curless
C. Neil & Beth Davis
Gary & Cynthia Davis
Steve Dye
Kara East
David & Garrett Eby
Kristen & Trevor Edwards
Elbit Systems
Frank Thompson and Weaver LLC
Fort Worth Air & Space Museum Foundation
Linda & Harley Garrett
George & Louise Gilkerson
Greg & Pam Gilkerson
Dr. L.J. Goodgame
WB & Clair Gurley
Dana & Elaine Gustafson
Marlin & Cindy Haberstroh
Hartzell Propeller
Don & Karen Hightower
Gary Hillhouse
Rick & Gay Ho
Sam Hobson
David & June Holoubek
J. Humphreys
L. Jackson
Mr. & Mrs. Joe Jordan
Ben & Candied Kidder
Roger & Margaret Kroes
Kubecka Flying Service
Donald & Shirley Kubecka
Grant Lane
M. Leemann
D. Ligon
Thomas Lisenby
Mike & Adrienne McClendon
Mr. & Mrs. Charlie McCool
Becky McCullen
Leland & Patricia McDivitt
Andrew D. Moore
C. Musckat
National Agricultural Aviation Association
Billy Nicholas
LR & Deborah Palmer
Pratt & Whitney Canada
Charles & Cheryl Prothro
Reed's Fly-On Farming
Mr. & Mrs. Ronald Robbins
Ronny Rogers
Cary & Jayne Rucker
Jamie & Debbie Sargent
K. Schroeder
J. Richard Schwalje
Donna Schwartz
Matt Sercy
J. Smith
Springcreek Aero Club
Mr. & Mrs. Dennie Stokes
Chuck & Rick Stone
Sherry & Tom Storey Jr.
William & Patricia Tate
Bill & Dianne Taylor
Heather Hamilton Tedford
Thrush Aircraft
Traction Marketing Group
Larry & Terry Tucker Families
Ricky Turner
Troy Vaught
Billy Wheeler
Wipaire Inc.
Cameron Wischer
Women of the National Agricultural Aviation Association
Gwynn Woodward

Special Assistance to the PAASS Program

Dr. Scott Bretthauer
County Line Flying Service Inc.
Desert Air Ag
Dr. Brad Fritz
Glover Aviation Inc.
Ron Harrod & the Arkansas AAA
Hartley Flying Service Inc.
Dr. Clint Hoffmann
Eric Klindt
Dr. Murphy Smith
Attorney Mark Stubbs
Mark K. Tabor – TSA
Thomas Helicopters Inc.

2011 SPRING BOARD MEETING RECAP: Big Issues on the Agenda

By Jay Calleja
Manager of Communications

NAAA, WNAAA and NAAREF held their spring board meetings Feb. 11–13 at the Crowne Plaza Hotel in Arlington, Va. The meetings kicked off with a breakfast fundraiser for AgAv PAC, NAAA's Political Action Committee, featuring U.S. Sen. Mike Johanns of Nebraska.

Sen. Johanns, who served as Agriculture Secretary under President George W. Bush and Governor of Nebraska from 1999–2005, spoke about the current outlook for agriculture and his efforts to repeal a provision in the health care law that will result in an avalanche of new paperwork for businesses. The little-known provision mandates that all companies beginning in 2012 must issue 1099 tax forms to any individual or corporation from which they buy more than $600 in goods or services in a tax year. The senator expressed confidence that a repeal of the 1099 requirement would get passed this year.

Unlike other sectors, the U.S. has a trade surplus in agriculture, but there isn't enough corn in the pipeline to keep up with demand, Sen. Johanns said. That could have a ripple effect throughout agriculture and push prices up on other commodities, he observed. The combination of tight supply, high demand and government regulations that stifle production are causing food prices to increase and could lead to inflation, according to the senator's presentation to NAAA.

After NAAA's opening General Session, the various NAAA, WNAAA and NAAREF committees met and deliberated on a wide range of important issues. Here are some highlights.

The **Budget & Finance Committee** approved the 2011–2012 budget and submitted it to NAAA's board for final approval. Several other committees brought funding requests before the budget committee. The **Long Range Planning Committee** asked for funds to seek counsel from an outside expert to aid the association in revising its governance and membership structure. The **Communications & PR Committee** asked for funds to produce and distribute wind tower ads for operators to use as bill stuffers in their invoices to farmers. A sample will be sent to each operator, and operators will be allowed to order as many as they will reasonably use. The budget committee approved those requests along with a request for funds to supply each NAAA member with a copy of the new Aerial Application Study Guide, a guide developed as a preparation manual for state aerial category pesticide exams.

From l–r, NAAA President Rick Richter, Nebraska members Rick Boardman and Craig Bair and NAAA Executive Director Andrew Moore greet Sen. Mike Johanns (R-Neb.), second from left, after NAAA's AgAv PAC breakfast.

In other committee news, the **Communications & PR Committee** submitted a motion to the board granting NAAA the authority to partner with Syngenta on a pesticide stewardship brochure tailored to aerial application. It will be called the Aerial Applicators and Pesticide Stewardship Brochure. No commercial or trade names would be used, and NAAA would have final approval of the content. The brochure will be posted on the Syngenta, NAAA and Pesticide Environmental Stewardship websites.

The **Convention Committee** evaluated NAAA's 2010 Convention in Savannah; chose a theme for NAAA's 2011 Convention; and selected convention sites for 2012, 2013 and 2014. "Ag Aviation, America's Winning Hand" was chosen as the theme for the 2011 convention Dec. 5–8 in Las Vegas. After a great

deal of discussion, the Convention Committee authorized negotiations with Savannah, Ga., for the 2012 and 2014 NAAA Conventions and decided to return to Reno, Nev., for the 2013 Convention.

With a possible end to FAA and EPA grants to NAAREF and challenges associated with securing continued funding for industry research at USDA-ARS' Aerial Application Technology Group, the **Long Range Planning Committee** discussed ways in which NAAA and the industry could mitigate or make up for the loss of this federal funding.

Another important topic was the issue of consolidation and the shrinking amount of operators and pilots in the industry. It was agreed NAAA needs to explore avenues to keep current dues and ensure member participation in the future. Possible solutions could include a dues structure tied to the number of aircraft or hopper size. Another suggestion was adding an additional membership category for former operators bought out by someone. President Richter agreed to appoint a subcommittee from several different standing NAAA committees—Long Range Planning, Constitution & Bylaws and Membership—to flesh out these ideas.

Finally, in NAAREF news, the updated Pilot Rescue Video has been completed except for the associated training manual. The video, which is aimed at first responders, will be shipped to all NAAA operator and pilot members later this year. The next board meeting will occur Oct. 7–9 in Greensboro, N.C. ■

"How to Promote Agricultural Aviation Positively!" Chosen as Theme of WNAAA's 2011 Scholarship Essay Contest

The Women of the National Agricultural Aviation Association have chosen "How to Promote Agricultural Aviation Positively!" as the theme of this year's WNAAA Scholarship Essay Contest. The WNAAA will award a $2,000 scholarship as top prize in the 29th annual essay competition, and Covington Aircraft Engines has generously agreed to sponsor a $1,000 scholarship.

If you are an NAAA member (or become one by June 15, 2011), WNAAA invites you to sponsor an applicant for the 2011 WNAAA Scholarship. The scholarship is not restricted to use for a "flying career." Any educational pursuit beyond high school (at any age) is eligible.

2011 Essay Contest Rules

The competition is open to all NAAA members and the children, grandchildren, sons-in-law, daughters-in-law or spouse of any NAAA operator, pilot member, retired operator or pilot who maintains an active membership with NAAA. The contest is also open to allied industry members and the children, grandchildren, sons-in-law, daughters-in-law or spouse of an allied industry member. Each allied industry company is allowed only one eligible family member. To qualify, dues must be paid by the organization or individual member on or before June 15, 2011.

Entrants must have graduated from high school prior to the entry deadline and be enrolled in continuing education during the year of entry. Previous winners are not eligible to compete.

The entry deadline is Aug. 15, 2011. Essays must be 1,500 words or less. Topic deviation and/or modification will not be accepted. Papers submitted will be judged on content, theme development, clarity, originality and proper grammar. All sources used must be cited. Plagiarism will result in immediate disqualification. Entries must be typewritten and double-spaced.

To ensure that the judges will not know the identities of the writer, keep any reference to the author's name, sponsoring company and company location out of the essay itself. A title page must be attached, however, and contain the entrant's name, address, e-mail address, telephone number, relationship to sponsor, sponsor's company name, address and telephone number. A photograph of the entrant and a short biography also should be included.

One copy of the manuscript must be sent by mail (postmarked by Aug. 15, 2011) to: **Erin Morse,**
WNAAA Scholarship Chair
P.O. Box 185
Connell, WA 99326

An electronic submission of the essay is also required, either by e-mail attachment to erinimorse@gmail.com or by disk to the mailing address above (postmarked by Aug. 15, 2011). Questions should be directed to Erin at that e-mail address or by phone at (509) 237-1880.

For more information, please visit www.agaviation.org/content/wnaaa-scholarship-contest. The winners will be notified by phone and letter and recognized at the 2011 NAAA Convention. ■

NAAA Membership Application

There's no time like the present to protect your future.

Become an NAAA Member today!

2011 NAAA Membership Application

Please note: NAAA Membership runs from Jan. 1 to Dec. 31 regardless of the date joined.

Membership Categories: (please select one)
Dues amounts are subject to change by NAAA Board.

Operators & Pilots who do not belong to a State/Regional Aerial Application Association must pay Participating Operator or Participating Pilot dues.

$450	___ Operator
	___ $10 each aircraft over 3
$170	___ Affiliated Operator
$900	___ Participating Operator
$170	___ Pilot
$340	___ Participating Pilot
$450	___ Allied (1–10 employees)
$680	___ Allied (11–50 employees)
$850	___ Allied (51–100 employees)
$1,000	___ Allied (101–500 employees)
$1,700	___ Allied (500+ employees)
$170	___ Affiliated Allied
$85	___ Associate
$225	___ International
$680	___ State/Regional Association
$170	___ WNAAA

Allied Industry Indicate your division:

__ Airframe __ Application Technology __ Chemical
__ Dealer/Parts __ Insurance __ Propulsion __ Support

Not sure which categories applies to you? Visit www.agaviation.org/Membership%20Classification.pdf for more information.

Name: _____

Company: _____

Address: _____

City, State, Zip: _____

Bus (_____)_____ Home (_____)_____

Fax (_____)_____ Cell (_____)_____

E-mail _____

Website: _____ Spouse _____

NAAA Dues $_____

NAAREF Donation $_____

Please consider a donation to support NAAREF programs.

(NAAREF depends on your donations to pay for PAASS and other programs such as Compaass Rose, Operation S.A.F.E., Fly Safe and Athena. PAASS attendance fees do not completely offset program costs. Your additional donation, made out to NAAREF, is greatly appreciated and is tax deductible.)

Total Payment $_____

Payment via: ___ Check Enclosed ___ Credit Card

Card # _____ Exp Date _____

Signature _____
(signature authorizes billing credit card)

Cardholder Name _____

Cardholder Address _____

Date _____

Mail to: NAAA, 1005 E Street St., Washington, DC 20003 Ph: (202) 546-5722 Fax to: (202) 546-5726 E-mail: information@agaviation.org Join online – www.agaviation.org

Dues, contributions or gifts to the NAAA are not tax deductible as charitable contributions for income tax purposes. Dues and similar payments may be deducted as ordinary and necessary business expenses subject to restrictions imposed as a result of the NAAA's lobbying activities as defined by Section 13222 – Omnibus budget Reconciliation Act of 1993 {IRS Code 162(e)}. NAAA estimates the non-deductible portion of dues paid during calendar year 2010 as 17%. Agricultural Aviation subscription cost ($30 for domestic, $45 for international) is included in membership dues for all membership categories.

Welcome to New Members

As of January 26, 2011

OPERATOR

Pierre Smith
Smith Aviation Inc.
Louisville, GA

Melvin Neidert
Ulysses Air Service
Ulysses, KS

Steven Hill
Hill/Air LLC
Tillar, AR

AL-INSURANCE #1

Mindy McFarland
Advanced Aviation Insurance Services
Roseville, CA

AFFILIATED ALLIED

Barry Dowlen
Falcon Insurance Agency of Houston
Kerrville, TX

PILOT

Tyler Armstrong
Melville, SK

Jeffrey Cass
Ringgold, GA

Robert Harris
Bloomfield, MO

Douglas Krueger
Traudt Aerial
Aurora, NE

Murray Louden
Martensville, SK

Jacob Nickel
Portage la Prairie, MB

Adam Oke
Sarnia, ON

Chad Ollinger
Amarillo, TX

Romke Sikkema
Sebring, FL

Russell Westcoat
East Prairie, MO

ASSOCIATE

Tom Adams
Winter Haven, FL

Monte Bowling
Mach Flight Services LLC
Waterford, WI

Richard Dickey
Turbine Technologies Corp.
Jupiter, FL

Charlie Huber
C. A. Huber Inc.
Williamsburg, VA

Peter Olson
Dubuque, IA

Larry Welken
Valley City, NC

NTSB Accident Report

Date	City	State	Aircraft Type	N #	Injury	Description of Accident
12/02/10	Gregory	AR	AT-602	9145H	None	Engine failure due to water in fuel
01/10/11	Oakley	CA	S-2R	4977X	FATAL	Hit MET tower and crashed

CLASSIFIED

BASF continues support of Operation S.A.F.E. in 2011

Collaboration with NAAA incentivizes aerial applicators to participate in S.A.F.E. fly-ins

NAAA is pleased to announce that BASF has renewed its commitment to offer financial incentives to NAAA members who participate in Operation S.A.F.E. Fly-in clinics in 2011. This is a continuation of a program BASF initiated in 2010 in collaboration with NAAA to provide financial support for participating aerial applicators that can be used toward membership in NAAA or for new spray equipment.

The goals of the BASF Equipment and NAAA Membership Rebate Program are to encourage operators and pilots to pattern test their aircraft at an Operation S.A.F.E. Fly-in; provide an incentive to equip eligible aircraft with new nozzles and/or tips; encourage membership in NAAA; and promote aerial application optimization and stewardship.

"More than 800 aerial applicators participated in 99 Operation S.A.F.E. fly-ins over the last two years," said Tony Goede, BASF Plant Health Coordinator. "This important program helps ensure efficiency for the entire aerial application industry."

Aerial application operators can earn a $225 incentive to be used to help subsidize either 2011 NAAA operator membership dues or up to $225 of the cost of purchasing new nozzles and/or tips for each eligible aircraft that participates in an Operation S.A.F.E. Fly-In within the program period. Participating pilots may be eligible to receive a $170 rebate that would reimburse many pilots for the full cost of their NAAA membership dues.

In order to take advantage of the BASF Equipment and NAAA Membership Rebate Program, an operator or pilot *must* be an NAAA member and actually be the pilot flying the pattern evaluation. Although it is not necessary to be an NAAA member to participate in an Operation S.A.F.E. fly-in, the participant must become an NAAA member before applying for and being granted approval for the rebate. The operator or pilot must also be sure that the Operation S.A.F.E. analyst has his complete and correct information so that the analyst can provide that information to NAAA for submission to BASF. The operator or pilot must complete the application and send it to BASF to be reimbursed for some or all of their 2011 membership dues or submit receipts to receive a rebate for nozzles and/or tips purshased for the aircraft. Please visit NAAA's website at www.agaviation.org for complete details about the program and to download the application for reimbursement.

"This program is proven to enhance professionalism in the aerial application industry by directing aerial applicators to join NAAA, where they have access to the library of education and communication stewardship services offered by the association," said Andrew Moore, Executive Director of NAAA. "The program also allows applicators to equip their aircraft with new equipment to ensure precise applications. We appreciate BASF's commitment to the industry, and thank them for making this incentive program available."

Operation S.A.F.E. was developed in 1981 by NAAA and managed by the National Agricultural Aviation Research & Education Foundation (NAAREF). The program is designed to demonstrate that agricultural aviators recognize their responsibility to ensure precise agricultural chemical applications.

Operation S.A.F.E. clinics give operators and pilots the opportunity to test equipment with a trained analyst to help interpret the information and to recommend changes to improve performance. Held regularly throughout the year, the fly-ins help applicators learn about and comply with all pertinent legal requirements. In addition, participating applicators agree to submit voluntarily to an inspection of their aircraft. NAAA encourages every operator and pilot to participate in an Operation S.A.F.E. clinic annually.

"Operation S.A.F.E. fly-ins are a great opportunity for applicators and one of the best means of evaluating spray patterns, droplet size and application precision," Goede said. "BASF also is working hard to increase participation and NAAA membership, for the good of everyone in the industry."

The BASF Equipment and NAAA Membership Rebate Program is part of BASF's ongoing stewardship efforts for aerial applicators, and the safe and proper application of its products. Visit www.plant-health-pilots.com for a variety of resources BASF provides aerial applicators, including an "Ask the Expert" section and true flight stories from aerial applicators across the country. For more information about Operation S.A.F.E., please visit the NAAA website at www.agaviation.org/content/operation-safe. ■

CHEMINOVA
HELPING YOU GROW

FYFANON® PLUS ULV is an applicator friendly premix of the most active pyrethroid in the world (gamma-cyhalothrin) and malathion. FYFANON PLUS ULV is the most effective and efficient way to control adult and nymph tarnished plant bugs, stinkbugs, leafhoppers and aphids in cotton. A total spray volume of only 32 ounces per acre multiplies efficiency so you'll be loading less and flying more.

Here's the bottom line: for effective, convenient premix control, FYFANON PLUS ULV adds up to great performance plus more airtime across lots of acres, minus expensive application costs.

For more information, visit www.cheminova.us.com or call 1.800.548.6113.

FYFANON® PLUS ULV
INSECTICIDE

Think about it!

ALWAYS READ AND FOLLOW LABEL DIRECTIONS.

More pilots trust Air Tractor, and for good reasons.

Your customers rely on you, just as you rely on Air Tractor. For generations, Air Tractor has been the one constant in this industry. Dependable. Faithful. The one with staying power.

Air Tractor Global Dealer Network

Domestic

FARM AIR, INC.
(877) 715-8476
farmair@winco.net

FROST FLYING, INC.
(870) 295-6213
jrfrost47@hotmail.com

LANE AVIATION
(281) 342-5451 /
(888) 995-5263
glane@laneav.com

NEAL AIRCRAFT, INC.
(806) 828-5892
larry@nealaircraft.com

QUEEN BEE AIR SPECIALTIES
(208) 745-7654 / (800) 736-7654
chipkemper@aol.com

SOUTHEASTERN AIRCRAFT
(772) 461-8924 / (800) 441-2964
mail@southeasternaircraft.com

VALLEY AIR CRAFTS
(559) 686-7401
valleyaircraft@clearwire.net

Parts Only

ABIDE AERO CORP.
(662) 378-2282

International

AGSUR AVIONES, S.A.
(Argentina & Brazil)
+54-2477-432090
amoreno@waycomnet.com.ar

AIR TRACTOR EUROPE
(Europe & North Africa)
+34-96-265-41-00
v.huerta@avialsa.com

CONAIR GROUP INC.
(Canada)
(604) 855-1171
rpedersen@conair.ca

FIELD AIR (SALES) PTY. LTD.
(Australia)
+61-353-394-222
sales@fieldair.com.au

FROST FLYING, INC.
(Central & South America,
except Argentina)
(870) 295-6213
jrfrost47@hotmail.com

LANE AVIATION
(Mexico, Central & South America,
except Argentina)
(281) 342-5451 / (888) 995-5263
glane@laneav.com

MOKORO SAFARIS
(South Africa)
+27-568-181-703
mokoro@mweb.co.za

QUEEN BEE AIR SPECIALTIES
(Canada)
(208) 745-7654 / (800) 736-7654
chipkemper@aol.com

AIR TRACTOR®

Air Tractor, Inc.
Olney, Texas 76374
940-564-5616

airtractor.com