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Cover image: The Bronto Skylift F28ALR first response unit includes everything a firefighter needs; a fire truck, an aerial ladder platform and a rescue ladder. Image courtesy of Bronto Skylift.

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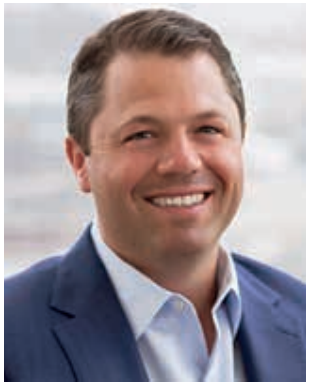
How optimized initial attack strategies are winning a new wildfire war

Around the world, wildfire behavior is changing. In the U.S., climate change, unhealthy forests and human development in the wildland-urban interface (WUI) are combining to create more frequent, fast-burning blazes. As crews on the ground battle these dangerous and increasingly common threats, we have a duty to provide them with the best support to ensure their safety and success. One key piece of that support system is fire aviation.



Brett L'Esperance

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Surprisingly, as the U.S. wildfire environment has grown significantly more challenging over the past 20 years, aerial firefighting approaches and aircraft mobilization tactics have remained largely unchanged. It's time to reevaluate these strategies and adopt more modern, technology-enabled methods with the potential to better contain blazes in the WUI. Doing so will improve safety and reduce workload for the firefighters with boots on the ground, limit wildfire devastation and help control ever-increasing fire suppression costs. In turn, this will free up valuable funds for forest health programs that can help reduce the rate of megafires and the associated risk to wildland firefighters.

A changing U.S. environment

Today, U.S. wildfires burn three times the number of acres they did in 1989. This dramatic change has led to a significant uptick in suppression and recovery costs, culminating in 2017 when the U.S. Department of Agriculture (USDA) spent the most it ever has battling wildfires—$2.4 billion. And there's no sign that the threat is slowing down. Climate scientists from the U.S. and Canadian Forest Services and University of Idaho have estimated that by mid-century, western parts of the U.S. will experience a six-fold increase in the number of weeks during which weather conditions are favorable for 'very large fires' (spanning at least 5,000 hectares). The lengthening fire season is no new trend; over the past four decades, the average has grown by 78 days.

Adding to this complexity, growing numbers of Americans are settling in the

▼ **Dauntless Air Fire Boss completes a drop as part of a recent training exercise.**

Image courtesy of Dauntless Air

Image courtesy of Dauntless Air

▲ Three Dauntless Air Fire Bosses perform simultaneous water scoops before heading back out on a training mission in 2018.

WUI—as of 2010, one in three U.S. homes were in this zone. This increase in people and property requires more firefighting assets to ensure safe and effective suppression which in turn drives up costs, putting a heavy strain on budgets. Nearly every year since 2000, U.S. Forest Service (USFS) suppression costs have exceeded budget allocations, requiring the agency to borrow funds from forest health programs to pay its suppression bill—a budgetary practice called fire borrowing. Years of fire borrowing from forest health programs has resulted in overgrown landscapes more prone to catastrophic fires. Solving this problem will require more than a one-year funding "fix" like the one passed by the U.S. House in 2018. To truly reduce costs, limit fire borrowing and protect funds intended for forest health programs, the country needs to revisit aerial firefighting tactics and establish more cost-effective initial attack strategies that keep small fires small and associated costs down.

Reimagining traditional tactics

In 2007 when the USFS initial response success rate dropped by just 1.5 percent, it represented an estimated 150 more small fires that escaped containment and cost between $300M to $450M to suppress. By avoiding decreases like this, USFS could generate hundreds of millions of dollars in savings that could be used to fund critical fuel removal tactics like forest thinning and prescribed burns. However, the reality is that many aerial firefighting models are not optimized to quickly respond to and contain today's fast-burning fires.

Instead, aircraft are often deployed when a fire has escaped initial containment and grown into a larger disaster. When this happens, typically large and very large air tankers (LATs and VLATs) drop numerous loads of retardant around a fire to contain the blaze through indirect attack. Turnaround time between drops often exceeds one to two hours for LATs and VLATs due to the time-intensive procedures required for loading high volumes of retardant. Turnaround time may also be impacted by aircraft base requirements, as large aircraft must operate out of large airports as opposed to smaller, regional bases. As with all aircraft, turnaround time contributes to the overall length of a wildfire mission, which in turn increases aircraft operating costs.

When a small fire does break initial containment efforts, LATs and VLATs play a critical role in suppression, albeit at a high cost. The significant cost required to acquire, retrofit, and maintain LATs/VLATs naturally limits the number of aircraft available. With a small number of large aircraft operating from limited bases, LATs and VLATs cannot be as widely distributed as smaller, less expensive aircraft across a fire-prone region. This difference makes LATs and VLATs primarily suited for indirect attack on large fires, a role that will continue to be highly effective and important in fighting big blazes. However, for small fires to be contained, public entities must bolster rapid and direct initial air attack capability in order to quickly respond to and contain fire starts in the WUI. Otherwise, small wildfires will increasingly grow into large public health disasters that risk human life, create dangerous and taxing conditions for wildland firefighters, and require millions of dollars to suppress.

Optimizing initial response

So, what's the right path forward? To strengthen initial response strategies, we can take action to improve three main categories of fire aviation: aircraft, flying tactics and technology.

Use smaller aircraft to increase the speed of initial attack

During initial attack, every millisecond counts. Small, forward-attack aircraft

Image courtesy of Dauntless Air

▲ **Fire Bosses fly in a coordinated group over Spokane, Washington, U.S. during a 2018 Dauntless Air training exercise.**

like single engine air tankers (SEATs) are needed for their ability to get off the ground quickly and maneuver a fire's frontline, dropping continuous loads of water, foam, gel or retardant. These aircraft, along with small helicopters, can quickly reload in between drops, returning to small regional bases to reload, or scooping directly from a nearby water source. Amphibious scooper air tankers – like the Air Tractor AT-802F Fire Boss – add undeniable value to a firefighting fleet given that at least two-thirds of U.S. fires have been within ten miles of a scooper-accessible water source (and ~80% have been within five miles of a helicopter-accessible water source).

In addition, SEATs and small helicopters enable a widely distributed basing strategy in anticipation of dispersed fire starts. SEATs, whether wheeled or on floats like the Fire Boss, are much less expensive to contract and operate compared to their larger counterparts, allowing departments to deploy more aircraft and create nodes of resources in fire-prone areas. With more nodes of aircraft, SEATs can dramatically improve the speed of initial response.

Leverage group flying tactics to increase the effectiveness of initial attack

Initial attack is even more effective when aerial resources are deployed in coordinated groups. Take, for example, a U.S. state that recently replaced its two aging CL-215s with six SEATs – four Fire Bosses and two wheeled SEATs. Doing so took the fleet's tank capacity from 2,800 gallons to 4,800 gallons; and with added physical assets enabled a more flexible basing strategy. By changing its strategy, the state saved millions of dollars in annual wildfire fighting costs that continue year after year. Like in this example, by deploying a network of forward-attack aircraft in coordinated groups, agencies can increase tank capacity and tactical flexibility while saving on operating costs.

Embrace technology innovations to increase initial attack precision

In firefighting aircraft, there are certain innovations that make a fleet a more efficient and effective early strike tool, including thermal imagining units to accurately target hot spots, onboard gel blending systems to improve drop effectiveness, lighter fire gates to carry more water and match drop patterns to fire types, smokers to enhance visibility as well as onboard collections of geo-referenced data to show the location, quantity and types of drops made. In the future, the U.S. will increasingly embrace technologies that are already in use in some other countries, including night vision capability, pilot-monitored automatic flight missions and (eventually) autonomous/non-piloted operations.

The wildfire threat is constantly changing, and the firefighting aircraft, flying tactics and innovative technologies we use to battle them must undergo continuous improvement to ensure we're bringing the most effective approaches to every wildfire mission. Right now, there are still many improvements that can be made to optimize the methods used to fight wildfires at the federal, state and local levels.

The most important thing we can do to reduce the risk of megafires for U.S. communities and those responders who risk everything to protect them is to enable rapid response and quick containment of small wildfires in the WUI before they grow into larger disasters that put people at risk. This will put the U.S. in the best position to make the jobs of wildland firefighters less taxing and dangerous, shorten fire suppression missions and control costs and return critical funds to forest management programs that remove the dangerous fuels accumulating in our wildlands.

For more information, go to www.dauntlessair.com