

Precision over volume

Sunny Sethi, Ed Collet and Andy Soccadato rethink brush truck turrets in the age of the megafire

Wildland firefighting is no longer a regional challenge confined to traditionally fire-prone areas. From grassland fires in Australia and Southern Africa, to wind-driven roadside fires across Southern Europe, to expanding wildland-urban interface (WUI) zones in North America and parts of Asia, fire services worldwide are confronting a shared reality: fires are becoming larger, faster and more complex, while suppression resources remain finite.

At the center of this challenge sits a piece of equipment often taken for granted- the brush truck or light wildland engine turret. Historically designed around high-volume discharge and rapid tank depletion, many turret systems remain optimized for conditions that no longer exist. In an era defined by water scarcity, extreme wind and extended response times, the assumption that “more flow

equals more control” is increasingly unsustainable.

The question is no longer how much water a turret can deliver but how effectively each gallon is used.

The limits of the “big gun” philosophy

For decades, suppression technology evolved in an environment of relative abundance. Urban fire engines were supported by pressurized hydrant networks, while rural apparatus often operated under the assumption that water tenders or refill points would remain accessible.

This philosophy shaped turret design around high, fixed flow rates intended to overwhelm fire fronts. In practice, this approach has proven poorly suited to wildland operations, where light engines and brush trucks typically carry between 700 and 1,500 liters of water. At traditional turret flows,

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tanks can be emptied in minutes, forcing crews to disengage just as fire behavior intensifies.

Internationally, this challenge is magnified in remote regions where refill cycles may take 30 minutes or more. During that interval, wind-driven fires do not pause. The result is a tactical paradox: the very tool intended to provide rapid knockdown can, if misapplied, accelerate loss of control.

Volunteer, auxiliary and rural services

Across many countries, initial attack on grass, bush and roadside fires are frequently handled by volunteer, retained or auxiliary services. Whether in North America, Australia, the UK or parts of Europe, these organizations share common constraints: limited budgets, ageing apparatus and minimal specialist maintenance support.

Highly complex turret systems—dependent on delicate electronics or proprietary components—often struggle to survive this operational reality. When failures

occur, repairs may be delayed or systems decommissioned entirely, pushing crews back toward fully dismantled suppression.

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While effective, dismantled tactics increase firefighter exposure to heat, smoke and entrapment risk, particularly during mobile incidents. What these services require is not more technology, but technology that reflects how and where they operate: robust, intuitive and maintainable in the field.

Wind: The universal adversary

Wind is the defining variable in wildland firefighting worldwide.

Whether across open plains, coastal scrub or agricultural corridors, sustained winds regularly exceed the thresholds at which traditional water patterns become unreliable.

Fog and combination nozzles, effective in structural interiors, rely on atomization to increase surface area. In high winds, fine droplets are easily deflected, evaporated or carried away from the target. Water is consumed without contributing meaningful suppression.

Smooth bore streams counter wind drift by maintaining a cohesive mass, but they introduce a different limitation: point impact. Wildland fires are linear targets. Suppressing them with a narrow stream requires constant manual articulation, increasing operator workload and leaving gaps where fire can re-establish.

Matching stream to target

Blade™ nozzle technology addresses this challenge by reshaping, rather than atomizing, the water stream. By maintaining laminar flow within the nozzle, the system produces a flat, cohesive sheet of water composed of large, high-momentum droplets.

This geometry delivers two critical advantages. First, large droplets retain ballistic integrity in crosswinds, allowing water to reach the fuel rather than dispersing into the air column. Second, the flattened profile aligns naturally with roadside and flanking fires, enabling continuous wet-line creation in a single pass.

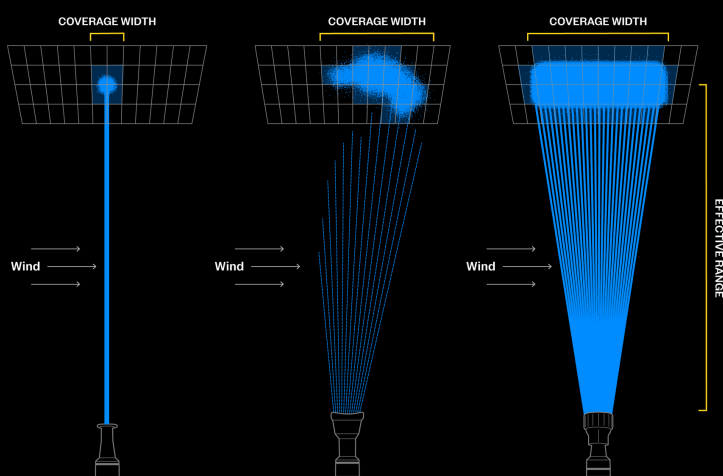
In pump-and-roll operations, the Blade™ pattern behaves like a moving squeegee, coating fuel beds evenly as the apparatus advances. This reduces operator fatigue and improves consistency of suppression. Wildland fires are linear problems and effective streams must be linear solutions.

Penetration to the seat of the fire

In many grass and brush fires, combustion occurs beneath a surface canopy of vegetation. Fine ▶

Surface Coverage

Top-down comparative view of stream footprints



Smooth Bore

- ✗ Low coverage
- ✓ Long range
- ✓ Surface cooling
- ✗ Low gas cooling

Fog Cone

- ✓ Area coverage
- ✗ Wind deflection
- ✗ Low surface cooling
- ✓ Gas cooling

HEN® Blade

- ✓ Wide area coverage
- ✓ Long range
- ✓ Surface cooling
- ✓ Gas cooling

Water Mapping Physics: Matching Stream Geometry to Fuel Geometry

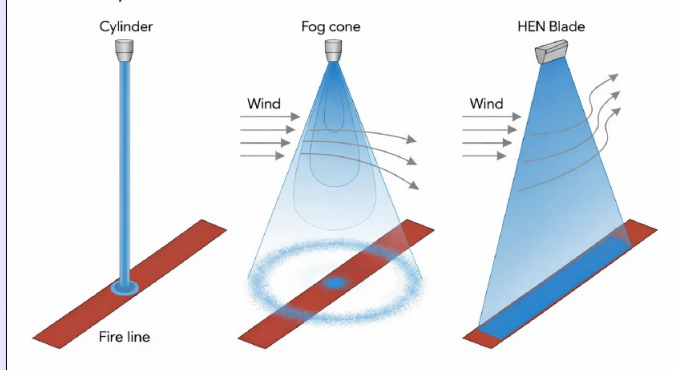


Figure 1: (Left) A smooth bore stream covers a small point. (Center) A fog cone wastes water on the periphery and small droplets are blown away by wind. (Right) The HEN Blade pattern creates a coherent, wind-stable sheet that matches the linear geometry of a roadside fire.

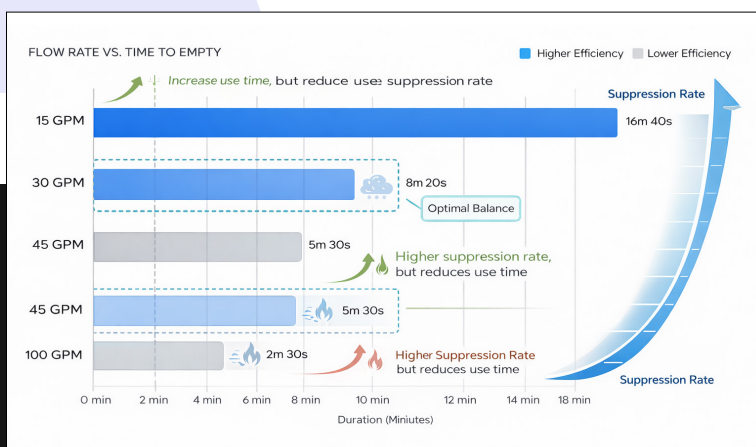


Figure 2: Operational endurance of a Type 6 Engine. Running at the HEN optimized 30 GPM yields over 8 minutes of attack time.

droplets tend to adhere to this canopy or are lifted by convective heat before reaching the burning layer.

The Blade™ stream's preserved mass and velocity allow droplets to penetrate through surface fuels and reach the combustion zone at ground level. This interrupts the fire at its source rather than merely cooling the surrounding air, an especially important factor in heavier fuels such as scrub, heath or low woodland.

Rethinking water economics

Modern wildland suppression demands a shift from maximum flow to matched flow. Field experience across multiple regions indicates that an operating range of approximately 15–45 gallons per minute (or 60–170 liters per minute) provides an effective balance between reach, penetration and water conservation.

At moderate flows, a light engine can remain engaged for significantly longer, extending suppression lines during rolling attacks and reducing dependence on frequent refills. Maintaining high nozzle pressure at lower flow rates preserves stream reach and effectiveness.

The TITAN™ system enables operators to adjust flow dynamically from inside the cab, matching output to changing fire behavior without stopping or reconfiguring equipment. Water conservation is not restraint- it is a force multiplier.

Low-profile turret mounting improves vehicle safety and visibility, but it can limit direct visual confirmation of stream impact. Smoke, terrain and vehicle pitch further complicate operator awareness.

Integrated flow intelligence, marketed as Fluid-IQ™, addresses this challenge through real-time feedback on flow rate, pressure and total water used. This data provides operators with immediate situational awareness and supports post-incident review.

Over time, access to usage data enables agencies to refine tactics, standardize training and identify inefficiencies.

A safer, smarter application

Rolling attack tactics remain central to international grass and roadside fire suppression. Here, the advantages of controlled flow and flat-stream geometry converge.

The Blade™ pattern's vertical depth provides tolerance for vehicle movement over uneven terrain, maintaining coverage even as the apparatus pitches or bounces. High-velocity discharge allows crews to remain on hard surfaces while reaching fires in ditches and fields, reducing the risk of vehicle immobilization.

Precision as a global standard

The megafire era is redefining what effective suppression looks like. Water scarcity, extreme wind and extended operations demand tools that prioritize efficiency over excess. The evolution of brush truck turrets from high-volume appliances to precision instruments reflects a broader shift in firefighting doctrine. Systems that integrate controlled flow, wind-stable stream geometry and actionable data allow agencies, regardless of size or geography, to do more with less.

As wildland fire risk continues to expand globally, precision water application will not be a niche innovation. It will be the new standard by which suppression effectiveness is measured.

About the authors

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