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In this section, we have a focus on aspects of global aerial firefighting

TECHNOLOGY AND TEAMWORK: APPROACHES TO WILDFIRE MANAGEMENT

Jennifer Ferrero explores the latest and most effective methods of using technology and managed collaboration to combat the escalating wildfire risk around the world

Firefighting technology in 2024 and beyond comes down to modern technologies in use with collaboration and community. There are iPads, cell phones, high-tech software, and satellites for rapid response; other, more traditional methods are also in play. Various technological approaches exist in a global economy with high-tech and low-tech nations. Some approaches are still rudimentary, and some are highly advanced. The fire risk is ever increasing due to urbanization and climate change factors. But there is more continuity and collaboration than in the past, with an astounding volume of technological resources. Experts say that the technical options exist; now, it is a matter of all resources consolidating approaches.

THE GLOBAL ORGANIZATIONAL APPROACH
Globally, firefighting experts are working to detect outbreaks faster while communicating with crews sooner. Many city, state, and county agencies collaborate – although this space can face challenges of coordination or competition.

One global organization stands out from an analytical and academic perspective. Professor Johann Goldammer is Director of the Global Fire Monitoring Center (GFMC), located on the campus of the University of Freiburg, Germany. Goldammer started the organization in 1979 and is a recognizable industry force leading aerial firefighting conferences. The first was in 2008 in Athens, Greece, which he chaired. In 2023, 15 years later, he said: "When I co-chaired this conference together with Ms Zisoula Ntasiou

from the National Coordination Center for Operations and Crisis Management of the Hellenic Fire Corps, we ended this 15-year journey in an atmosphere of improved mutual understanding of the needs of coordinating firefighting on the ground and from the air."

> **66** **The Fire Hub will be a one-stop institution from which fire management stakeholders from around the world can obtain information and advisory services** **99**

In 2024, the GFMC will transition to the United Nations' Global Fire Management Hub. Goldammer explained: "The hub will be a one-stop institution from which fire management stakeholders from around the world can obtain information and advisory services. The Fire Hub may also serve as a broker of support by international organizations and donor countries or institutions to enable countries, institutions, and civil society organizations to take advantage of the rich experience in fire management worldwide."

From a technological perspective, the GFMC researches and reports on rural and urban firefighting environments. There are many differences between the two. Goldammer said: "In most rural lands of the continents,

neither firefighting vehicles nor aerial firefighting assets are available. In the vast areas of natural and cultural landscapes of Africa, Asia, and Latin America, local communities rely on their own engagement, experience, and modest but effective hand tools."

In developed nations, "advanced technologies are coming in rapidly". Goldammer said the advancements are in vehicles, fire suppression equipment, chemical agents, and personal protective equipment. He noted that uncrewed aerial systems were used for "reconnaissance, monitoring, and decision support in firefighting operations".

The GFMC does not operate as a firefighting organization. But it has members of 14 regional networks and eight regional centers worldwide with "close relationships with government authorities and regional multilateral intergovernmental organizations." Goldammer added: "At the international level, we have established interface procedures with the United Nations, which regulate the option to activate advisory services during wildfire emergencies globally, for instance, by dispatching regional experts to assess critical situations and determine the need and justification for international assistance."

THE REGIONAL FIREFIGHTING AGENCY APPROACH
Chief Brian Fennessy of the Orange County Fire Authority (OCFA) and partners in southern California have developed the Quick Reaction Force (QRF). On its own, the OCFA has 1,300 firefighters on staff, fighting hundreds of wildfires per year. They operate five rotary-wing craft and staff one fixed-wing aircraft, with six agency pilots through OCFA and a dozen contract pilots through the QRF.

The collaboration between OCFA, the County of Los Angeles Fire Department, Southern California Edison, and Ventura County Fire Department aims to serve as "an armed force capable of assembling and moving at speed to reinforce troops in contact with the enemy", according to its charter. The enemy is wildland fires, which they attack with four QRF aircraft, all-night vision capabilities, and a mobile retardant base.

Fennessy said there had always been talk of what-ifs in wildland firefighting. They decided that if they could combine these organizations "with the largest water/retardant dropping helicopters in the world, we could provide more of a surge". As a

group they could continue dropping at night, and using retardant. The mobile retardant base would require less turnaround time than fixed-wing airtankers, greatly impacting the mitigation of serious fires.

Technically, they employ Phos-Check fire retardant, nighttime firefighting with goggles, and a common operating picture (COP) with data, maps, imagery, and video. One solution is in the Intterra software platform and the University of California San Diego's WIFIRE Lab. Through these tools, they have machine learning with fire spread modeling and mudflow modeling, taking the information provided by satellites, fuel, moisture, topography, and why fires burn the way they burn. Fennessy said: "They can provide us through the data that the S-76 gathers of what we can expect the fire to do to bring resources to the area impacted most." He added: "Intterra compiles all resources into one common operating platform. In our business, the three questions everyone has are 'Where's the fire? How big is the fire? Where is the

fire going?' We need a tool that tells us where, how big, and how fast it grows, and the UC San Diego supercomputer lab continues to update the fire spread models." He said they get continuous and consistent data in their collaborative organization and get the same information.

So, while technology is mission critical and utilized in southern California to help with serious problems like overgrown forests, urban encroachment into forests, and hotter and dryer seasons, Fennessy said one big challenge is still collaboration between groups. Fennessy was featured in an episode of 60 Minutes on US television, 'Taking the fight to the night against California's wildfires with new helicopters'. He shared that there is still a stigma in collaboration within the firefighting culture. He added: "There is a significant aversion to change by other agencies, even ▶

when the tools available have positively demonstrated the ability to save lives and protect property and infrastructure."

Fennessy said the technology, such as autonomous aircraft, is here now, but an agency must be open to accepting it. "But there remains anxiety when it comes to anything new, and many are so wedded to how we've done it for so long. Technology has outpaced us. So now, it is up to us to try to catch up."

THE SOFTWARE INTEGRATION APPROACH

Intterra describes itself as an "all-hazards common operating picture, aggregating all of your data to help you plan, prepare, respond, and recover". It delivers a centralized picture of resources, fire lines, preplans, and more, in near real time, wherever you are. It integrates computer-aided dispatch (CAD), records management systems (RMS), automated vehicle location (AVL), and other public safety systems into a centralized visual interface for risk, response, and recovery.

Robert Edson, Chief Customer Officer and spokesperson for the organization, said: "It's a typical tech problem – you get a lot of new tech trying to accelerate what a market space had identified as a need. In this case, we are trying to identify wildfire ignitions faster. Often, you end up with a lot of disparate technology. What you've done for a first responder is to make it harder to get the information they need quickly." In Intterra's case, it aims to help fire agencies to find useful information faster.

It also serves fire departments through federal, state, and local contracts, including county fire departments, regional and statewide programs in Washington, Colorado, Oregon, and California, and is integral to the US federal response as well.

Although the software is complex, crunching data from many sources, Edson said: "Our common operating picture ingests data from various platforms, consolidates it, and presents it to a user in a way that is best for them to consume information. In short, we meet the first responder where they are and deliver what they need, when they need it, and how they need it so they can decide and act."

In Sweden, the firefighting company Saab has worked with Zenitech to produce a virtual/mixed reality product to aid with the planning of firefighting. The tool, POSeidon,

is a cross platform application that allows users to plot the course of a live firefighting operation in a 3D environment (and also train in the extended reality space). Its aim is to replace some of the work done on traditional physical charts, and improve the planning of flight routes with interactive and live updates of the positions of the target fires, other firefighting and public service units, obstacles, and other salient information. The system also grants the ability to get a preview of the mission from the cockpit to familiarize the pilot with the route from their perspective, helping them to know what to expect and improve the safety of the operation.

THE AIRCRAFT FIRE SERVICES APPROACH

Dauntless Air has fought wildfires for over 25 years as a full-service firefighting operator. Brett L'Esperance, CEO, said: "We secured our first state Fire Boss contract in 2007 with Minnesota, and our first federal Fire Boss contracts in 2009 with the Bureau of Indian Affairs and Bureau of Land Management."

> **❝ Our common operating picture ingests data from various platforms, consolidates it, and presents it to a user in a way that is best for them to consume ❞**

Today, the company owns and operates 17 Fire Bosses. "Our fleet is the world's largest and most technologically advanced Fire Boss fleet. Also known as the Air Tractor AT-802F, the Fire Boss is a fixed-wing, single-engine scooper purpose-built for aerial firefighting. When near a water source, we can perform continuous scoops and drops on a wildfire for 3.5 hours before returning to a base."

Dauntless Air's team of pilots, mechanics, and crew chiefs get deployed throughout the USA, and occasionally Canada, to fight fires through state and federal firefighting contracts.

L'Esperance said that the Fire Boss is the most "efficient and effective airplane available in the fight against wildfires. No other airtanker attacks fires with the speed, agility, and effectiveness of the Fire Boss. And the

advantages don't stop with performance; it's also the most economical platform out there."

When dispatched to a fire, Dauntless pilots receive information on iPad applications and other avionic resources and direct communications with the air attack platform. "iPads are small and light enough to be used by our pilots during flights. The air attack platform is a separate plane that circles over the fire and carries a highly experienced firefighter coordinating all aerial resources coming and going from the fire traffic area (FTA). The air attack radios real-time fire intel back to our Fire Boss pilots. Our pilots are also informed on the day's upcoming weather, fire, and risk patterns in morning briefings conducted daily by state or federal land agencies at each base."

L'Esperance added that they also enhance the Fire Boss with innovations that "elevate the safety, effectiveness, and reliability of the aircraft". They use infrared imaging to navigate through wildfire smoke and trees, and have an onboard gel blending system that "injects environmentally safe water enhancers or gel into each load. With this infusion, water can better reach the ground and 'stick' to the fire. This cools the environment and creates less dangerous and taxing conditions for crews on the ground. In addition to these enhancements, Dauntless installs and utilizes additional aftermarket technologies that support increased safety when scooping, [which is] the most challenging part of flying the Fire Boss."

The company also uses 'heads-up' displays (HUD), which reduce pilot fatigue by "displaying important instruments in front of the pilot's eyes, so they don't have to look down at their controls, including the infrared capabilities overlayed on the HUD screen".

Finally, the pilots rely on their infrared capability to help them find targets in a growing fire. L'Esperance said they are all in constant communication with each other and that they foster communication skills.

IN SUMMARY

Consolidating global organizations, modeling best practices, data crunching, and engagement with equipment have improved firefighting management options. However, tech works best when combined with old-school partnerships, interagency collaboration, and communication. ■