Fire Watch
Los Angeles Fire Department
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FLYING HIGH

Steven Robinson was a pilot who could not fly. A horrific helicopter crash in March 1998 killed most of his crew and left him with a head injury that nearly killed him — twice. He still has the EKG tape that shows his heart stopping. The injury eventually left him medically unable to pilot an aircraft, relegated him to light duty four days a week and made his future with the Los Angeles Fire Department uncertain. He recovered from the incident — after nearly two years of rehabilitation — and even got his pilot's license back.

But in 2001, Steven Robinson suffered a seizure and was grounded again. His future was tenuous. "When I was on light duty, I was sometimes looking for things to do," Robinson said. "I needed to get something going quickly, or the Department was going to be done with me."

All the while, the Department continued to battle wildfires the only way it knew how: putting "the wet stuff on the red stuff," said Robinson's cohort and fellow pilot, Lance Messner. "You see a fire from an aviation standpoint and from ground Units, and you get out there and kick its butt."

It is not a very scientific or efficient approach, and it is dangerous, especially for fire crews on the ground.

But as Messner and Robinson continued to fight fires — Messner piloting the craft and Robinson helping navigate — Robinson began playing with a new UltiChart computer on one of the helicopters. It is a basic GPS device that helps the pilot get from one point to another. Robinson found AeroComputers' UltiChart did more than just aid navigation; it also produced fire perimeter lengths and acreage coverage, which impressed Incident Commanders.

Whenever a fire broke out after that, the pilots' phones would ring, and Incident Commanders would want the two pilots airborne and helping ground Commanders locate hot spots. The duo flew over a fire, "geo-referenced" the area by latitude and longitude with the UltiChart, and provided the information via radio to ground Commanders equipped with handheld GPS units. Those Commanders then knew exactly where the fire was and could avoid hiking around arbitrarily looking for hot spots.

"We started getting calls from the Forest Service, Los Angeles County, and the California Department of Forestry because they did not have the ability to do this," Messner said.

After more experimentation with the UltiChart, Robinson discovered he could produce GIS maps. When the duo received a request to provide some infrared images of hot spots during a fire near San Bernardino, California, they also created a GIS map of the fire. They videotaped the image of the map with a handheld camera and showed the tape to Incident Commanders, who were in awe.

A Better Way

Buoyed by the interest in his maps, Robinson made a phone call to Russ Johnson, Public

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our full commitment and dedication. We will always look beyond the traditional scope of our individual positions to promote teamwork and organizational effectiveness.

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Safety Industry Manager at ESRI.

I said, "I am fireman Steve from L.A. City, and I want to learn how to do this," Robinson recalled, explaining his interest in GIS mapping and describing to Johnson the process he hit upon to deliver GIS maps to Incident Commanders.

Johnson listened and knew he could help streamline the process. "The only way they could get that information to people who needed to make decisions was to land the helicopter, pull the disk out of the onboard computer, go into their operation center, plot a map, roll it up, hit plot again, take off and fly it physically to the Incident Command Post, come back, get another map, hit print again, fly it physically to the police headquarters or Incident Command Post, do the same for the next Commander," said Johnson.

"By the time the last person on the chain got the map, it was outdated," he said. "This was just something that screamed for a better way."

The information collected by the helicopter was vital to public safety officials and others — such as Animal Services Department, Department of Transportation, Department of Recreation and Parks, and the Department of Public Works — all of whom needed the data to respond. The problem was how to get the information out of the helicopter and into officials' hands before it was outdated.

Johnson, Messner, and Robinson came up with a solution: Develop some good base data, including census data, street data, topographical maps, etc., and put it all on a server. Then develop a system where the dynamic data — information collected by the aircraft during a fire or incident — is quickly available to any agency that needs it.

Commanders and other city personnel on the ground could then easily access the data, and use it to develop evacuation routes and other emergency plans — especially important early in the life of a fire or other incident.

"You always have a time of confusion where you do not have an Incident Command Post established," Johnson said. "You do not have an infrastructure built around the incident to manage a multi-day event. It takes a while, so information is really poor during that buildup."

ESRI worked with Robinson on how to prepare GIS maps and donated computers, servers, software, and staff. ESRI's partners — CMH2 Hill, a systems integrator, and HP — were charitable as well.

They virtually asked, "What do you need?" Robinson said of HP. "I thought I

would be a little ridiculous. I said, 'I need two laptops, a server, two PDA's, two desktops, and a couple of tablet PC's.' A truck showed up and dropped it off."

ESRI saw the relationship as a good opportunity to showcase its technology and help develop a public safety solution.

"Part of our motive was, if we can help them solve this problem and learn the most effective way to solve it, then we can all learn from it and pass the lessons on to other users who have similar issues," Johnson said, explaining that the generosity was partly loyalty to a good customer, as well as an opportunity.

"Anytime we can help a user advance our technology that they have invested in so it adds value, we are always interested in doing that — not across the board because we can not afford to, but particularly on shared problems that really do not have a standard solution yet," Johnson said.

For Robinson, it was the niche he needed, and he said he considers himself lucky.

"What they are trying to do is get my program off the ground, because if it works here, it will work anywhere," he said.

Data Rich Fly Over

ESRI updated the AeroComputers database, which provided storage space, and deployed its ArcView mapping program, which allows Robinson and Messner to map data layers. The maps contain layers of base information already in the database combined with the dynamic information collected during an incident.

As the aircraft flies the perimeter of a fire, the ArcView program maps the fire, using reference points such as trees and structures. Every second or so, a reference point is laid down as the fire's perimeter is traced, creating a shapefile outlining it. The shapefile is exported to a floppy and then, using ArcView, the file is overlaid on the database data to produce a layered map.

The layered mapping provides critical data for public safety and other officials, especially during those chaotic first six to 12 hours of an incident.

"The people responding do not necessarily know that over the hill is a senior citizens' home or there is hazardous material in a warehouse next door," Johnson said. "That kind of information is usually collected on the fly."

"Oftentimes, even though public safety people may not have information that is good and accurate as quickly as they would like, there are other people *really* outside the loop," Johnson said, citing peripheral agencies such as Animal Services Department, which would need the information in case livestock or other animals need to be evacuated; or the Department of Recreation and Parks, which could provide staging areas; and transportation, and the Public Works Department would also benefit from early data.

"Say I am the parks' guy," Johnson explained. "I need to have the fire perimeter or damage data fused with information about my parks so I know what is going on."

Animal Services Department would take the dynamic data, or fire data, and fuse it with the base data such as farm and livestock locations to form a plan, according to Johnson.

"Give all those people the information they need so they are singing from the same song sheet from the beginning."

Simi Valley Breakthrough

The process of dispersing dynamic data efficiently is evolving as Robinson and Messner continue to ply what they learn during incidents, drills, and fires. The two demonstrated that the process worked from a proof-of-concept standpoint at the Simi Valley fire, which ate up a good bit of Southern California last fall.

The fire threatened expensive homes in the area, and Robinson and Messner were asked to map the flames to determine its proximity to

the City. Robinson had been supplying ground Commanders with maps for wildfires and training incidents to promote his experiment, but this was a different day.

"I was a little shocked," he said about receiving the call to map the fire. "I knew the fire was going on, but it was not in the City yet. I am thinking,

'Really?' I had been waiting for this day to come."

The pair flew the perimeter of the portion of the fire closest to the City, and Robinson collected the data and overlaid it on the base data to create the maps.

"We have to take an aggressive posture and get out and attack the fire," Messner said, even though the approach puts fire personnel at risk. Still, he said, the risk is being mitigated by the new technologies. "We can keep ground personnel out of certain areas. We can fly over an area and map it and see that the terrain is too rough to deploy ground troops."

Robinson demonstrated during the Simi Valley fire that he could show the fire's progression and speed by time-stamping the fire's track lines — the lines tracked by the aircraft.

"If you see one [track line] was done at 9:00 and the next one was done at 9:15, all you have to do is multiply the distance times four and you will know the rate of spread per hour," he said, adding that he and Messner can fly the perimeter of a fire and calculate the fire's acreage, its perimeter length, and the number of homes and people within that area.

"You can imagine the value of getting that information because they may have a better idea at that point about what kind of resources they may need to bring into the area and mitigate the incident," he said.

Gaining Converts

It took a little time for Fire Department officials to accept the technology and what it could do, but it is happening.

Messner said a significant influencing factor for senior officials is that "they can sit down in their office with a large map of the incident while it is going on and make decisions in a clinical environment."

Battalion Chief Patrick L. Engel has been a part of Air Operations for more than 15 years. He is eager to go full speed with the mapping technology, saying it will save lives, property, and resources.

"If you have 30 [fire] companies three hours out in front of a fire, they are not doing you any good," Engel said. "This will help us predict how far out in front of a fire we have to get so we are not wasting companies in areas where they are not going to be used. On the safety side, we can move companies out of harm's way when we know the fire is going to be burning into them."

Of course, officials are still looking at a hard-copy map. Robinson and Messner want to change that. "I think where this is going is real time," Messner said. "We want everything as close to real time as possible."

That means pushing the data to the disaster preparedness center downtown in real time so the mayor and other department heads can make decisions before an incident or fire is out of control.

A glimpse of that paperless future was displayed

during a national homeland security drill called Operation Determined Promise that used a specially designed, interactive Web site through which Incident Commanders could get real-time information.

Johnson said the process of getting data to Commanders and other officials is “a thousand times better” than it used to be.

“They either had to describe verbally over the radio to people on the ground — or land and explain [in person] — or land and print a map,” he said. “Now, instead of having to print a map, which can take a while, they can land and get it on a Web service that everybody can access and see.”

Scoring a Touchdown

Incident Commanders like what they have seen so far and have asked Robinson what else he needs to keep the initiative rolling.

“I said, ‘I need a rig to be able to do this, a vehicle,’” he recalled, adding that he has received some funding for the emergency-response vehicle already and more is expected from homeland security grants. He said he envisions a 25- to 30-foot long mobile command center built on a commercial chassis. It will contain all the computing equipment needed to acquire, create, and produce GIS maps, including a printer, a server, mapping computers, and a video downlink.

He said he is hoping to equip the vehicle with a 65-inch monitor and flat board display over it.

“Let’s say I’m getting video downlink information or thermal imaging downlink from the aircraft,” he explained. “I can push that out through cabling into the Incident Command Center, and Incident Commanders can use the SMART board overlay and draw directly over it. They can draw right over that real-time imagery as they are getting it.”

Robinson also foresees the day when reverse 911 will quickly alert citizens who are in harm’s way. He would fly the perimeter of the fire, fuse the fire’s data with base data to determine who is impacted on the ground, create a layered map and intersect it with reverse 911, which would automatically call those homes or businesses and tell them to evacuate.

Johnson and ESRI hope Robinson’s drive and the resulting initiative ends in a “touchdown” — a repeatable, cost-effective solution for use anywhere.

“Part of ESRI’s objective here is to be able to say, ‘Look at Los Angeles and what they have done,” Johnson said. “Here’s how they have done it and here is the way you can do it.’”

But at some point, ESRI will have to declare “game over” in terms of the donated resources, and funding solutions will have to emerge.

“In today’s world, there are a lot of funding sources for innovative solutions, particularly when they solve a real, identified problem and there are multiple agencies that benefit,” he said.

That will happen when a prototype of the GIS fire-mapping system is developed. It is not far off, but there is still plenty to do. That is just fine with Steven Robinson.

Written by Staff Writer Jim McKay for Government Technology.

Special Thanks to Steve Robinson, a 19-year veteran of the Los Angeles Fire Department and the members at Air Operations for their contributions for this month’s “Fire Watch.”