

Video Transcript: Mics & Sirens Season 2 – Episode 4

[Female Narrator] You're listening to Mics and Sirens, the official podcast of the Department of Fire and Emergency Services in Western Australia. DFES acknowledges the traditional owners on the land of which this podcast is created, the Whadjuk people.

[Sirens sound while news footage of fires play]

[Dr Karen O'Connor, Earth Fire Alliance] We will build a system that I kind of coin the United Nations of Fire Detection. Every fire agency in every fire-prone region of the world can get a data update on the fires in their region every 20 minutes. The estimates of direct and indirect costs of wildfire to the US is \$400 billion per year. Our system costs somewhere in the vicinity of a thousandth of that. And I think that's the game changer here.

[Female Narrator] A fire starting in the middle of nowhere used to mean hours, sometimes days, before it was detected. Now, satellites orbiting hundreds of kilometres above Earth can spot a fire as small as five square metres in minutes. Dr Karen O'Connor from the Earth Fire Alliance has been at the forefront of using satellite technology to help emergency services act faster, smarter and safer. In this episode, Karen explains how space-based fire spotting is changing the way we protect people, property and the environment, here and across the globe.

[Di Darmody, Interviewer] Welcome, Karen.

[Karen] Thank you.

[Di] Would you be able to tell us exactly what the Earth Fire Alliance is and why it was formed?

[Karen] So, we're a non-profit organisation, and we have an intention to be a global non-profit. And we were formed to be a conduit for wildfire data for the global fire community. We saw a gap in fire information from space that we think we can help to solve. And in doing it as a non-profit, it's a very different conversation than if we would be doing it as a commercial entity.

[Di] Why is that?

[Karen] Because the only thing we're aiming to do is to deliver a public good capability. We're not here to make money. We're here because we want to make change. And so we're actually not asking for upfront customers to pay anything for this system. And that's what makes it unique.

We have developed a public-private philanthropy partnership. And we have philanthropic support for the first phases of this program, which means that the philanthropies see that it's important and vital enough that they want to put funding towards the first phases, and show what the opportunity can deliver. And then the intention long-term is that we will build a system that I kind of coin the United Nations of Fire Detection, in that it's not one system for one country. And it's not a commercial product to make money. We just want to have enough support from multiple countries that we can maintain a system that everyone benefits from.

[Di] I read that the goal of the Earth Fire Alliance is, and I'm quoting here, "to ensure that every fire, anywhere on Earth is visible and understood in near real time." Why is that important, Karen?

[Karen] When we think about fire in the landscape, I think, particularly in Australia, right? It's such a large area, and there's so many fires happening that we often don't even understand just how many fires are lit at the same time. And the emergency services really have a tough job trying to locate them before they can do anything about it. And the way we think about it is fire agencies shouldn't have to go looking for the fire. They shouldn't be spending their time and energy doing that. If we can build a system where we can give them that situational awareness of every fire in their region, then they can spend their time thinking about which fires they need to actually respond to, rather than spending their resources and energy trying to look for them.

[Di] I mentioned a constellation of satellites. What exactly is FireSat, and how will it work?

[Karen] FireSat is our platform. We are planning to build a constellation. The reason we're looking at a constellation of satellites is because we want them to be sitting low enough - close to the Earth that they can see at high resolution, which means that they're a low Earth orbit satellite. Low Earth orbit satellites keep moving around the Earth. And so the more you add to the constellation, the shorter the gap between one satellite passing over an area and a second one passing over an area. And so, we've calculated the constellation of 52 satellites, will give us an average revisit of 20 minutes globally. So, that means every fire agency in every fire-prone region of the world can get a data update on the fires in their region every 20 minutes.

[Di] It's quite the project then, isn't it?

[Karen] It is.

[Di] [Laughs] So, when it's fully operational, you mentioned some of the unique qualities, but how is it different from other satellite systems? I'm thinking, is it getting really busy up there in terms of satellites? Are you using what's existing, or are these new?

[Karen] It is quite busy. I will admit that. We do wanna work with existing systems, and we wanna collaborate with everyone that has fire monitoring systems. There just aren't very many that are fit for purpose for fire. So, most of what the fire agencies use right now are systems that have been built for research purposes, and other monitoring purposes that happen to be able to see fires. And so that's what they get used for as well.

So, you think about MODIS, which was a NASA-provided system, that's a sensor on one of their satellites. And it sees fire at certain wavelengths, but its pixel size is about 400 metres. So, it's not gonna see a fire until it's at least probably an acre or more in size, because it wasn't designed to see fire small. You look at other systems like Landsat, it's designed to look in very great detail. I think it's about a 30 metre pixel size, and it's looking at the landscape. So, it gives amazing agricultural information and vegetation information, but it's also not designed to detect fires. And so with both of those, they're really good at certain things, and they're OK at detecting fires, but they're not designed for it.

And the other disadvantage of some of those systems is the revisit. So, they may only come over every couple of days. So, if you've had a good image over a fire that's been running for a week or two, you may not get another image for a day or two. And so we wanna shift that. We want to have reliable and accurate information, high enough resolution that you can pick out the details of the fire and information about the fire, not just that it's there. And be able to update that regularly so that agencies can make a decision on whether they respond based on the potential danger of that fire.

The difference of this system is that it's fit for purpose and designed specifically for a fire. And the reason I say that is we actually interviewed fire agency members, hundreds of them, from Australia and the US, to ask them, if we build a system, what does it need to do? And so this system is specifically designed to deliver what they've asked for.

[Di] You have some quite bold predictions about reductions in the number of homes and acres burnt, as well as money saved through FireSat. Can you share some of those and what that data is based on?

[Karen] We conducted a study with an economic team here in Australia, Mandala Partners. And what we were looking at when we did that was looking at, well, can we show that this is value for money? And I think we did that in spades. And one of the particular statistics that always sticks with me from that was that the US alone, the estimates of direct and indirect costs of wildfire to the US is \$400 billion per year. Our system costs somewhere in the vicinity of a thousandth of that. So, when you think about the cost versus benefit of a system like that, it's kind of a no-brainer when I think about it.

[Di] So, how have fire agencies been involved in the project so far, Karen?

[Karen] They've been involved since the very beginning. And that's really a hallmark of what we've been doing. We feel very strongly that the people who use it need to be the ones who are setting the requirements for the system. And so while Earth Fire Alliance has only been stood up for about a year and a half, this project has been going for about four years. And since the beginning of this project four years ago, fire agencies across Australia and land management agencies across Australia have been included in setting the requirements.

And then, the second phase of their involvement is the Early Adopter Program. So, now that we finally have imagery coming down from the satellite, what we wanna do is work with agencies who represent key use cases of using that data, in particular in geographic environments and with particular levels of capability.

And we have five different agencies across five different states in Australia that are already involved. And it's fantastic to be able to actually get their expertise in understanding how this data is gonna be used on the ground. And what we will learn from that, from their inputs along with others, is how this data is gonna be applied across multiple use cases. And their feedback will help us as we expand the program globally.

[Di] You mentioned that the first images have come down. I understand that's through the protoflight that you had in March in 2025. Can you tell us about what that involved?

[Karen] It was very exciting, I have to say. I haven't held my breath like that ever in my life. So as I said, this was like four years in the making. And we launched the prototype satellite

proflight, along with our commercial partner Muon Space, who built it for us, or with us. And the launch is really Muon's way of de-risking and learning about how this system is gonna work. And then we will be launching multiple more satellites.

But the launch itself, we did on a ride share. So, a ride share is basically a rocket that carries many satellites. As you said, there's a lot of satellites up there. A lot of people going to space these days. We were one of many. It's like getting a seat on the bus.

[Di] Right.

[Karen] But you really do hold your breath until that satellite gets launched and it starts communicating with you and feeding information down. And everything's gone very smoothly so far. So, we're very grateful. And the images that we've started to see, I think, are starting to help us understand what the world is going to look like when we have them in a live scenario. And all of the agency members that I've shown them to are very, very excited because it gives a level of detail. It doesn't just tell you that the fire is there. Gives a huge amount of detail about where the hottest parts of the fire are, and what direction it's potentially gonna be going in once we start to get the 20-minute revisits.

[Di] I understand that a cluster of bushfires in Northern Territory were part of the first images captured.

[Karen] Yes. One of the advantages of the Northern Territory and the great cultural burning practices that are conducted up there is that there's always fires to capture from space. We were looking for key regions where we knew we would pick up fire as we were doing the first testing. And the team had picked up very big fires in Canada, because it is summer and it is burning there. And I think my American colleagues didn't expect there'd be as much fire in Australia as there is. But Australia is always on fire. And so, particularly Northern Territory and northern Western Australia. And so it was amazing to be able to capture images from our local region, and be able to show what they're gonna look like.

And what they showed to me was not only large-scale, cool temperature fires, where you could just see the fire front and everything else was nice and cool, but it could also show the remnants of previous prescribed burning activities as well. So, it gave you an indication of where the previous work had been done. So, I think this is gonna be helpful not only during peak fire seasons when you need to detect a fire, but also in monitoring your land management practices, and helping to really get focused and strategic about where your risk management activities are occurring.

[Di] So, do you think in the future it could be used to work out where the prescribed burns, for the use of that term, should be?

[Karen] I think it'll definitely tell you where they have previously been recently and where vegetation has grown back or hasn't. And so, we never profess to be a tool that'll tell fire agencies what to do. But it'll be definitely a tool that'll help in their decision making about that.

[Di] I understand it's not just large fires that can be seen and recorded, is that right?

[Karen] That's right.

[Di] And why is that important?

[Karen] The way we think about it is the earlier you can find a fire, the more time you have to make a decision about it. Often, fire agencies will find a fire when it's already reaching a point where it's difficult to respond to. And if we can find a fire as small as five metres in diameter, we are giving that agency more time. More time to think about whether they want to put resources against it. More time to run scenarios of what damage it might cause, more time to think about what the weather situation is in and around that fire and whether they should let it run because it will actually reduce fuel load, and will not have an impact on community. So, ultimately, it's about decision-making. If you can find a fire early, you can do more in your decision-making about whether you do something about it.

[Male Narrator] Ever wondered what firefighting looked like almost 100 years ago? The trucks, the buildings, the uniforms; they were all very different from what they are today. Join Fireman Jack for a new tour, visiting the old buildings that make up WA's firefighting history. Visit the DFES website: dfes.wa.gov.au, to find out more now.

[Di] What happens to the images you collect, and how are they used and analysed at the moment?

[Karen] So, we're only just starting to bring the images down from the satellite, and it's still being tested. And what we're planning on doing with the first phase of images is to capture ones in the regions of our early adopters, and compare and contrast with the information they have on the ground to really validate the accuracy of the information from the satellites and compare and contrast with other sources of information. And that will help us to really understand what this satellite has the potential for doing once the full system is up and running.

[Di] Are there any challenges or concerns, Karen, around protecting the data from those satellites?

[Karen] Absolutely. We are very mindful of that, and we've been working with and talking with a lot of organisations that hold data and protect data and what we're definitely not planning on doing is doing our own thing. We wanna work with organisations that already are very good at that. And so we've already been working with ESRI, which is a known organisation that houses landscape data for agencies, and we've been talking with NASA, who also hold data on fire detections across the world.

And so it's definitely something we're thinking about, and it's definitely something we're mindful of, and we're very careful that it is our intention that the fire agencies get access to this data. But we're aware that it's the agencies that should be relaying this information to the public, so we don't have any intention of bypassing them in any way. And the other thing we're very aware of is just the scale of data we're about to start bringing down, so that's gonna require very secure cloud storage, which we're already looking at, and it is going to be a very big data problem. But it's something a lot of organisations are used to.

[Di] Where to from here, then? When will more satellites be in operation?

[Karen] So, as you said, we launched the first protoflight satellite in March this year. We are already in the process of building the next three. Our colleagues at Muon Space are building

them right now, and they will be launching them sometime mid next year, and those three satellites will be live. So agencies that are involved in the Early Adopter Program will start to then receive that live data, and that will be the really the true test of this system. And then from there, our intention is to build out the full constellation by 2030.

[Di] And that's, I think, you said 52 satellites.

[Karen] Yeah, that's the estimate at the moment.

[Di] Wow, it's a lot, isn't it?

[Karen] Well, the lucky thing is we've done some de-risking and testing with the protoflight. We will do some more with the first three. Once we know that the system works, it's basically building the same satellite over and over, so it'll become more of a production line and be quicker and cheaper the more we build.

[Di] How will fire agencies and people here in Australia benefit from this project, do you think, Karen?

[Karen] I think people across the world are gonna benefit from this project. And the fact that Australian agencies have been involved in helping with it means that they get to benefit not just their communities but communities across the globe, which is the most exciting part for me. I committed to doing this a number of years ago because I saw a gap, and same for my colleagues in Earth Fire Alliance. And we've had such a great response from the fire agencies who've been involved with it, that they see the value, and they see the potential of what they're gonna be able to do with this system, and it's really ultimately about them having awareness of fires so that they can help the community more. They can focus on the things they're good at: responding to the fires that they need to respond to, but they don't have to go out of their way to look for them, and I think that's the game changer here.

[Di] In this series, Mics and Sirens, we speak to fire and emergency experts from all around the world, and they all bring a vast depth of knowledge and a wide range of experiences, but all our guests are like you, Karen, and they're connected by a personal drive to improve how we respond to and manage emergencies. So we like to ask a few more personal questions at the end of each podcast, and I wonder if you wouldn't mind telling us what inspired you to undertake this type of work?

[Karen] So, I've only been working in the emergency services space for about five years now. So I'm not someone who's been around the space for decades like a lot of amazing experts that I meet. But I spent most of my career in defence. And I see that they're kind of similar problems. They're both the operational requirements. Turning technologies into operations is what I have done for a living for decades.

How I ended up in emergency services and what drew me to that was the 2019–2020 fires. I was working for the CSIRO at the time, and travelling a lot, and it seemed like every place I travelled was covered in smoke along the east coast, and it was a scale that I had never seen. I've lived in Australia for over 30 years. And I'd never seen anything like it. And when I received a phone call asking if I would help to set up a philanthropic program looking at wildfire resilience and trying to help to get ahead of it next time and try to change something that would reduce the chances of the disaster that we saw, I think it took me about 10

seconds to say yes, because I know I couldn't pick up a hose, but if I can use my skill set of innovation transformation to help anyone, then it was an absolute yes for me.

[Di] How do you go sourcing money for this? You said it's philanthropic. Is that an easy sell, so to speak?

[Karen] Every philanthropy is different. I think the opportunity here is to actually bring together multiple partners that all have something different to bring. So the funding is an interesting component, but it's not the only thing that philanthropies bring to it. They bring a vision. They bring an opportunity to have impact beyond a local region. And I think the key to underwriting a system like this is that everyone will see themselves in it, and everyone will see the opportunity that it brings. And as I said, it's a non-profit endeavour. It's a public-private philanthropic partnership.

The philanthropies are funding up front because that's what they're very good at. They're very good at de-risking. They're very good at taking that risk early on, showing that something has legs, whereas federal governments tend to need something to be a little bit more real before they are willing to put taxpayer dollars against it, 'cause it's taxpayer dollars.

And so, finding a way where both of those groups actually can work in their strength zone is the key to making these kinds of partnerships work. And so we've been really grateful for the amount of funding that we've had from philanthropies so far. And satellites are not inexpensive, and so having organisations like that standing beside us and saying, "we're willing to take the risk with you, and we're willing to actually put not just our money but our time and energy into this," says a lot about the potential they see in it.

[Di] Is there a particular incident that's happened where the technology we've been talking about could have been particularly helpful?

[Karen] Look, I think there's been a few probably incidents since we've started launching this program that I've seen. Europe is covered in fire right now, and it probably could have been helpful there. But the Los Angeles fires is one that I particularly had a conversation about. When that came through so quickly and caused so much devastation, I did ask someone who had a background in fire in that region, and asked them, "would our system even have helped because it was just coming so fast. Would our data even have helped?" And they said, "absolutely it would have." because in that situation, the winds were so high, that they couldn't even send up a plane to find out what the fires looked like. So they were really fighting that fire blind in a lot of parts of it, and it must have been devastating for the fire agencies there. So, I'm hoping that if something like that ever happens again, they'll have much better information because of what we're doing.

[Di] Notwithstanding FireSat, because I feel like it would be your answer if I was to ask you about the most important technological development to help the future of firefighting and emergency services. But is there something else in the technology space that you think will have an impact?

[Karen] This is probably gonna be a bit of a cheat answer because it probably is connected to FireSat, but, AI, I think, has a huge potential to change how we capture and learn information, how quickly we do it. FireSat is about to release, I hate to use a pun, but a fire

hose of information and data that people will have to make sense of and make sense of it very quickly. On top of that, there's tools the fire agencies have that look at fire spread and look at vegetation in the landscape. They have to bring all of this intelligence together to help them understand in that moment what the best course of action is, and I do think that artificial intelligence and machine learning has the biggest potential to help agency specialists cut through the noise, and be able to make sense of that information.

[Di] What's the most rewarding part of your job, Karen?

[Karen] I got together with a handful of colleagues and we founded this organisation because we knew no one else was necessarily gonna do it. And because it is a big endeavour. But engaging with agencies and people here who are the ones that will be using this data really refreshes me and reminds me why we're doing it, because it is an uphill battle. Building 50 satellites to monitor the globe is not a small feat, but we are all in it because we want to make change. Our whole team has a huge amount of experience from emergency services through to defence, through to NASA, and we've all come together because we feel that this is something important to do.

[Di] That's been fascinating to hear more about what you're doing, Dr Karen O'Connor. Thank you for being our guest on Mics & Sirens.

[Karen] Thank you very much.

[Male Narrator] Are you looking for fast, accurate, and official information that helps you to make informed decisions to stay safe during an emergency? The Department of Fire and Emergency Services Emergency WA app lets you set up watch zones for places important to you. So if an emergency happens in your watch zone, you'll receive alerts and warnings. The best part? It's sent direct to your mobile device. Download DFES' Emergency WA app from the App Store or Google Play today.

[Female Narrator] That was Karen O'Connor on the power of satellites in fire detection and response. You're listening to Mics & Sirens, the official podcast of the Department of Fire and Emergency Services in Western Australia. If you're enjoying this series, hit follow and share it with your network. Next time, Russell Turner from Fire and Rescue New South Wales joins us to discuss how drones are keeping firefighters out of harm's way.