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CONVERSATIONS ON INNOVATION

DANIEL STEVENS

TRANSCRIPT OF EDGY AIR FORCE'S INTERVIEW WITH CEO AND FOUNDER OF SEITEC

INTRODUCTION

Elsee:
"Hi, I'm Elsee here with the Creative Element on behalf of the EDGY AF program. We're here with our first Conversations on Innovation with Dan Stevens. Dan, what do you do over at SEITEC?"

Daniel:
"I am the CEO and founder, originally spun out of Defence in 2021 to build a system called UXO Tracks. The whole company revolves around that, and the idea is we're [going to] build this invention towards getting it into Defence capability, hopefully next year."

Elsee:
"So, tell me about that—what does UXO stand for?"

WHAT IS UXO

Daniel:
"Unexploded ordnance. So, it's when a bomb hits the ground or an artillery round and fails to explode, okay? Fails to explode—it's unexploded ordnance, and that's the thing that we're looking for. But we look for it at the time of impact, not in retrospect, so we're not there to clean up stuff that you would find in Vietnam or places like that, where there has the prevention, not the cure, okay."

Elsee:
"So, you're specifically looking for unexploded ordnance, not exploded ordnance?"

Daniel:
"Where we also look for exploded ordnance, okay, great—because, much like if you go down a rifle range and you shoot at a target, and you [want to] know where you hit, our fighter pilots need to do the same thing. So, they're throwing bombs from 10 or 20,000 feet, and they need to make sure they're hitting the target around about where they [want to] be hitting the target. So, the system also can do that, where it looks at where the bombs impacted and then finds a fairly accurate location, maybe down to a few metres."

Elsee:
"Okay, that's very accurate."

ACCURACY AND CURRENT TESTING

Daniel:
"A few metres—it's not bad, it's not bad. We still have a long way to go; we still have a lot of proof to do in our system out on the weapons ranges, because the only way we can prove and test the system is by getting out on weapons ranges, which is a hard thing to do. Luckily, the Defence doors

for us have been opened, so we can go out there and do all this work. But I'd say at the moment we can get to a few metres for high explosive bombs—bombs that go bang—and for bombs that don't go bang, at the moment we're looking at about anywhere between 20 and 40 metres, okay."

Elsee:
"That still makes retrieval less..."

Daniel:
"It's much easier. Well, the way I liken it is, right now you drop a bomb and it might leave behind a 60 centimetre hole, and you're looking for a 60 centimetre hole somewhere within a 10 million square metre area, right? So, right now we're going, 'Right, well, there's 10 million square metres where the 60 centimetre hole could be,' and so [the Defence Force] does its best to find it, but you can only do so much. […]It's a perfect definition of a needle in a haystack. So, what we do is we get it down to […] within 40, 50 metres of that 60 centimetre hole area, it's much, much easier to find it than it is right now, where they're sort of just going, 'Well, it seemed to be over in that direction,' doing ballistics profiling, and it's—it's a nightmare."

Elsee:
"Is the goal for determining accuracy of the pilots, or for retrieval of the unexploded ordnance?"

Daniel:
"The goal is retrieval of UXO—unexploded ordnance. As a happy side effect, we do the bomb scoring part […] so it sort of fulfils both sides. And over time, we plan to integrate more and more systems with UXO Tracks, the UXO tracking system, so we might integrate cameras and potentially in the future UAVs, other acoustic systems, so that we can have this big sort of integrated platform that contributes to getting people to those locations to retrieve them as quickly as possible."

EXISTING METHODS AND SEISMIC SENSORS

Elsee:
"So, what are the current methods for locating and retrieving the unexploded ordnance before your UXO project?"

Daniel:
"[…]eyes and ears. I believe the Navy still has people sitting on towers watching naval gunnery fire come in. We do have an existing system called Boris Bomb—Unpacked Bomb—on-range impact scoring system […] and it uses cameras to triangulate a position. The only problem with the camera is you're limited by field of view, right? Whereas our sensors—we use seismic sensors in our system, which gives you a sphere of detection. We can feel what's going up in the air, we can feel what's going down under the ground, and we can feel what's going out from that point, so it's a sphere, whereas cameras, radars, all those kinds of things are limited by field of view. Plus, all those other sensor types are also limited by obstructions, so you can't see through the trees, you can't see through buildings, whereas our system doesn't care what's on the earth—it just feels what comes through the earth. You're looking through the ground to find them."

Elsee:
"So, how far out does that work? Do you need sensors quite a range away?"

Daniel:
"I'd say our latest evidence is showing that we can see an inert bomb impact the ground from—[going to] be cautious about this, not over-promise—7 to 8 kilometres away, okay, with a single sensor […] We need a number of detections from [a] number of sensors to actually locate where the impact has occurred. But we also have some pretty nifty techniques in the background that we're working on, which will give us bearing to target from a single sensor, and multiple layers of localisation using completely different methods, to validate and verify the outputs of the system."

Elsee:
"Do you need sensors in the ground before the bombs drop?"

Daniel:
"So, the bombs need to be dropped in an area where there's some sensors around—7 to 8 kilometres radius […] typically, if a target area is 2 square kilometres, we might place sensors […] evenly spread out at a four-kilometre radius out from the target, which means it will be able to accurately pick up UXOs or high explosive impacts that occur within that array, right? So, you're talking […] 40 to 50 km² thereabouts. Anything that falls outside of the array, we can still see it, provided we have enough detections; we can still localise a coordinate, except it becomes less and less accurate the further you move away, because you have fewer sensors grabbing onto it. You have fewer sensors, and it's just the way the maths works—[it's always] better if you're inside the array to localise where it is. In the same way that if you have a mobile phone and you need to localise someone's mobile phone location, it's better if you have, say, three towers that are transmitting to you and you're in the middle […] If you're over here [gestures to the side] and you have three towers that are trying to localise you that way, it does make it a bit harder."

Elsee:
"So, it sort of encourages pilots to be a bit more accurate so that it works well."

COMMON FAILURES AND TRAINING APPLICATIONS

Daniel:
"[…]9 times out of 10, 99 times out of 100, it will be some kind of malfunction of the weapon, right, or an incorrect configuration. So, it might be, as an example, they might be throwing a JDAM, which is a type of bomb, a type of guided weapon. The guidance system might fail, a fin might lock out—there's a bunch of things that can go wrong, like there's more in the chain that can go wrong than can go right. By that, I mean everything has to go right for it to explode[…] Only one failure in the chain needs to occur for it to disarm itself […] I would argue that bombs are actually relatively safe […] generally, they only explode when they're intended to explode. If something goes wrong, they won't explode. Still doesn't mean you're not left with some ticking time bomb on the weapons range, and […] Defence is obligated to find that thing. But there are multiple ways that that can fail. There is the element of pilot error that can creep in; sometimes a coordinate can be programmed in incorrectly. But generally, those things you're [going to] see in training. […] where we're out on

training ranges, we're protecting that realm. Out on [operation], where we've got pilots out dropping bombs in theatre—on our enemies—in those situations, you're dealing with pilots that are highly experienced. There's a lot of checks done; I would not expect to see those kinds of failures occur out in the field, but in training, absolutely."

Elsee:
"It would be much harder to track those unexploded bombs in theatre on a battlefield, because there's a lot more bombs being dropped. So, the goal, it sounds like, is to help improve training and safety within training—is that right?"

FORWARD OPERATING BASE PROTECTION AND FUTURE USES

Daniel:
"So, I'd say 90% of our focus right now is the training range. But we have been asked about FOB protections, so Forward Operating Base Protection, okay? So, when we go into an operational theatre, we set up what's called an FOB, or a Forward Operational Base, and that's where our people go in and set up a base of operations to conduct whatever it is that we're conducting in that area. So, let's just say it's in Afghanistan or whatever it might be—we'll have a Forward Operational Base; from there, patrols will be sent out, and whatever else you can think of. So, what we're thinking about, what we've been asked about, is what if we went and put the UXO track sensors around the FOB […] Because inevitably, a time comes when we come under fire, and the thing is, is when we come under fire—mortar […] artillery, missiles, and RPGs—those kinds of things may come in and hit a base, but they're probably [more] likely to fail and have a UXO[…] than our relatively advanced systems […] that go through a bunch of validation and testing and all that kind of stuff.

Over there, there's a lot of improvised weapons that are put together, and inevitably you get maybe an RPG or a mortar or something that will hit in or around our base[…] and fail to explode, and now you've got a problem—you have this[…] ticking time bomb sitting there waiting that might explode, it might not explode, but who knows. And so it's key, then, that our operational personnel that are in situ[…] can find where they are to dispose of them and take away that safety issue, so that they can approach them more safely rather than stumbling across them. And, I mean, look—there are further applications.

If we can make the system cheap enough and easy enough to access, you think about Ukraine: you could potentially go into these areas where there could be a war that breaks out, or maybe there is ongoing war […] and we can place sensors around, which will aid in clean-up post-war or during. It doesn't take much to go online and have a look at EOD disposal in Ukraine—constantly pulling up UXOs."

Elsee:
"It's almost like disarming a minefield."

Daniel:
"Exactly, except […] there are a bunch of technologies out there to find stuff in the ground now,

right? But if we can get it out there, we can […] stop this problem in its tracks. I would say the concept came to me in 2018 […] I was working as the in-service coordinator on weapons ranges; my job was just coordinating projects for acquisition statements, for putting systems out on the range to do a variety of things. But it was then that I came across this issue—'Oh my god, what kind of systems do we have here to take care of this problem?' […] I saw there was a stated need from Defence that was, 'Hey, we have to take care of this UXO problem'.

So, I scoured the globe looking for solutions, and I couldn't find a thing, right? So, we tried to shoehorn something in to take care of the problem, and knowing full well it was the best effort at the time, but there was nothing out there we could actually use. So, at that point, I pitched the idea to Jericho. I had a very, very supportive CO in my unit who said, 'Look, as long as you do a few of these bits and pieces for me and help your team and help me, we'll contract out your position, yep, and I can go to Jericho.' So, went to Jericho, developed the system, and then we did a proof of concept in 2020, August 2020, out at Orchard Hills in Sydney—great—and we blew up a couple of bombs, a couple of explosives, probably two metres under the ground, a specific little area, and we were able to localise down—it was about six metres with the prototype version. Except it was like—I look at it from an engineer's perspective—like, that system was terrible, it was horrible.

It was a Bunnings irrigation box with strip-board, hand-soldered stuff, but that's how proof of concepts go."

EARLY PROTOTYPES AND PROOF OF CONCEPT

Daniel:
"We start with a cardboard prototype. If you could detect something, you're on the money, right? And we had people come out of that trial—Defence people—saying, 'Alright, how do we roll this out? Can we get this out there?' Like, 'No, you can't get this out there. There's no support, there's no spares, we're not [going to] have a team of five people building Bunnings irrigation boxes […] It was at that point where we looked at how to get this—like, how to get the centre capability. At the end of the day, Defence is a consumer; they are doing the task that the government sets out for them in the interest of the Australian Government's people.

They are not technology developers, right? Right, you do have branches like DSTG that are doing some really cool scientific advances, but they're not there to commercialise stuff—that really is industry's job, right? So, we assessed [if] could we develop it and support it internally, primarily because we don't have manufacturing facilities […] people post around every two to three years, so you don't have any continuity of that corporate knowledge, right? And we just don't have that internal capability to understand how to manufacture an industrial system that is designed to be out there on a weapons range in harsh environments for long periods of time.

So, that option was out the door. So, then [I] looked at, you know, do we push it out to industry? And we tried, and for a multitude of reasons it didn't work, I found. So, we did have some non-responses where they just said the technical risk is too high. We had some people pull out, some companies pull out after they came to understand the technology. Oh, and then there were just other little bits and pieces where, you know, 'Hey, we could do it, but we want Daniel to come

along with the system to help us understand,' and that wasn't something that Defence was really okay with, because at the end of the day, I'm a uniform member—they need to put me into certain roles, and that role is not to sit out in industry. You're a Defence member in Defence.

My boss at the time in Jericho, Michael Burgess—our Group Captain Michael Burgess Orton—he suggested the idea, 'What if you did spin out and do this? It seems like the only way we could get this capability into Defence was for you to step out of Defence and do it yourself in industry.' Once that decision was made, […] I had to cut ties with every single organisation that was dealing with me at the time, which was hard. Like, when you look at probity and conflict of interest, that was Number 1: 'Okay, I'm [going to] be spinning out of Defence, working on a technology that I invented in Defence, but […] we can't have this perceived as some kind of golden handshake, you know, to say jobs for the boys kind of thing.'

So, we had to make sure that everything was done right, which meant that it was really hard, really hard. But finally, I got to the point where I got out, and I was told, 'You know, there's no golden handshake out of the door. This is all on you,' right? And I just thought to myself, 'I get one crack at this life, and that's it.' So, worst-case scenario, it doesn't work—I find a job and recover, right? But if it works, then I can deliver something that was way bigger than me, […] much more capability than I ever could have delivered while I was in uniform, right? Much more capability then I ever could deliver as a consultant or work with someone else. So, I thought, 'I've got to do it. I have to do it. [You've got to] take your shots where they are.'"

Elsee:
"So, did Jericho help you with that transition—of stepping our Defence into industry—help me to the point of ensuring that all the people on approvals that I needed to make it happen were there, and that was imperative, that was absolutely imperative? It sounds like Jericho helped where Defence wasn't [going to] give you a golden handshake; Jericho sort of helped you get out and land on your feet a little bit, okay."

Daniel:
"But the key input—which, without Jericho, wouldn't have happened—was taking me from how I've got a concept to proving the concept, right? So, back of the napkin idea to how we've just deployed it and now I'm ranging—it works. Without Jericho, that couldn't have happened. And same thing with the Creative Element and the EDGY Air Force program […] it [kind of] spawned UXO Tracks, spawned SEITEC."

Elsee:
"So, do you have any advice for other people who [want to] pursue a similar track to yours?"

ADVICE FOR ASPIRING INNOVATORS

Daniel:
"I think the first thing is that—I mean, I don't know everyone's circumstances—but you've got nothing to lose. Then again, maybe people do; I guess in a holistic view, you've got nothing to lose. If you have a choice between working for someone for the rest of your life and doing what is asked

of you—if you're comfortable with that, fine—but if you [want to] try and do something different, if you [want to] try and build something, if you [want to] be a part of something bigger than you but you're able to drive that, you get one crack at this life and that's it. So why not? Because it doesn't matter how bad things get, you'll always be able to come back. If you've got enough tenacity to go out there and try and start a company in the first place, you've got enough to—if it doesn't work—to get a job and get paid again."

Elsee:
"Thank you so much for joining us today, Dan."

Daniel:
"Thanks, Elsee. It was a great experience."

Elsee:
"Great. This has been Dan Stevens from SEITEC, developing UXO Tracks and talking to us for our first conversations on innovation here at the Creative Element."