Trials, Tribulations and Success of a Defence SME:
Cirrus' MD Mr. Peter Freed's Address to AIDN NSW 25th Anniversary Dinner

Cirrus' Managing Director Mr. Peter Freed was invited to address the Australian Industry Defence Network (AIDN) NSW 25th Anniversary dinner held 20th November 2019 at The Sofitel, Sydney.

Mr. Freed describes the many challenges that Cirrus, as a high technology defence sector SME, has faced in its 23-year journey to success; and the many past, present and future technology innovations generated by Cirrus.

Peter was joined on stage by the AIDN NSW President Ms. Anna Murray.

Richard Glover *(introducing Mr. Peter Freed)*:

> Peter Freed is the founder and Managing Director of Cirrus Real Time Processing Systems ("Cirrus"), a leading Australian developer of simulation and sensor processing systems for the defence market.
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> Cirrus' success in these areas have been broadly recognised, with the company receiving a range of business awards including the DMO Industry Award for minor acquisition projects, Raytheon Australia Capability Partner Award, the Cisco Systems Innovation Award and the Telstra NSW Small Business of the Year Award.
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> In parallel with developing Cirrus, Mr. Freed has become well known as a vocal advocate of a greater role for the high technology SME sector in the Australian defence industry, including as a member of the AIDN NSW committee, and previously as board director of the Defence-industry collaboration "RPDE" and Simulation Australasia.
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> Mr. Freed holds a First Class Honours degree in Electrical Engineering from the University of Queensland which awarded him the University Medal for academic excellence.
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> AIDN has asked Peter to share the Cirrus story tonight as a great example of a high technology Australian SME.

Peter: Thanks Richard. I thought that as I am going to be speaking after Chris (*Mr. Chris Jenkins, CEO Thales Australia & New Zealand*), I would be a bit smart and mention 'The Fish'…But for the first time in living memory in Chris' speech – no 'Fish'! What are you doing to me mate? Well, as I said, it is not going to be about fish, but we will start a bit of a discussion about submarines.

There is a beautiful Attack class submarine which will be joining our service.

Let's roll back the clock… there is a Collins class submarine…a bit earlier in time.

Let's keep rolling the clock even earlier. That is the Oberon class submarine and we have reached the year 1996 when the Cirrus story started.

In its early days Cirrus was active developing the sonar related solutions for the Oberon class submarines.

Pictured here is one of our early products, which was a sonar analyser and this was supplied to the Oberon class submarines. That tool and a various other tools was fitted in the sound room of the Oberon class submarine.

Pictured here, scattered around that compact compartment are various items including equipment our company provided to acquire hydrophone data from arrays and recording.

It's fair to say that these early products were funded off the smell of an oily rag, but delivered really good capability, and in due course they were migrated to the Collins class submarines to help augment combat system capability of that platform.

So after a few years we'd emerged from the new company phase. We were doing pretty well, we had some products in operational use and we were making our way based on our competitive merits.

And then … Defence made the big decision to replace the Collins combat system. Now this decision was motivated by strategic factors well above what was or wasn't good for a defence sector SME and that's as that decision should be made, but the end impact on Cirrus was it essentially closed the door for work on the submarine for our company.

It was back to square one and Cirrus needed to find a new line of business.

I won't sugar coat it, what followed was some years of real struggle, where our company managed to stay afloat only by finding a succession of small technology development projects in different areas related to Defence.

One example is illustrated in the video. We did a project developing algorithms for the Air Force to data mine millions of recorded air tracks to find consistent patterns of air activity over Australia. The sample shows one such a group of flights that have been identified as belonging to one of the thousands of data mined patterns.

Another example involved developing the technology to efficiently disseminate sensor video from unmanned platforms through communications links that are both unreliable and bandwidth limited.

One key project we did in this time was to build a simulation system for the sonar and combat system of the Mine Hunter Coastal vessel. This picture shows a system which we delivered to the Mine Warfare Faculty at HMAS Waterhen.

This project drew on the company's expertise in sonar processing. Instead of our team developing software to process sonar data, they were developing the software that would simulate the effect of processing sonar data.

This project was heralded as a big success, the Instructors loved it; but once the project came to an end, Cirrus was back out in the cold.

Throughout this period, the company was essentially on a financial roller-coaster; while projects were on, we did well, as our team is very proficient at delivering against customer requirements,

but once the projects were finished, we'd starve. And we never knew just how long it would be until our next feed.

What was actually happening in this time was akin to an unseen arm wrestling going on.

One of the one hands of that arm wrestle was actually our reputation that was consistently growing over time due to our excellent track record of excellent delivery. But there is another arm in that arm wrestle and it is pushing the other way. That was the progressive tendency of Defence to become more and more averse to taking on projects with developmental risk. And not only averse to taking on those sorts of projects, but averse to the concept of contracting an Australian SME to do those projects!

The success or failure of our business hung in the balance as these opposing forces battled it out.

The key turning point for Cirrus came in 2010 - when the company was in its 15th year - when Cirrus was contracted to prototype an Air Combat Officer Training System to provide radar and sensor training for the Air Force.

The RAAF loved it, with production systems acquired by the RAAF the following year to use at the school, the (then) School of Air Warfare. The picture shows the early version of ACOTS system in a training aircraft at Sale.

This led to further contracts for the support of that system and for an ongoing programme of spiral development of ACOTS that continues on to this day and provides additional functionality to that school; including:
High fidelity simulation radar imagery,
… that can be configured to look like radars, such as may be used in many different types of aircraft,
… tools to enable trainees to learn how to use modern chart based mission management tools to collate sensor data and develop the tactical picture,
… and some other equipment provided for the ground school, in this case a Part Task Trainer for the Front Right Hand Seat position of the cockpit.

The good word on the system spread, and this enabled Cirrus to export a variant of this product pictured here in its particular packaging.

Success begets success, and a few years ago Cirrus received substantial contracts from the Navy this time to develop further simulation training systems. One of these is for the Navy's COMCEN (communications centre) operators.

Pictured is the training room at HMAS Cerberus where our recently delivered system is being used to train communications centre operators of the Navy.

And another training system we were engaged to develop was a training system for the Navy's tactical EW operators on the Major Fleet Units. Pictured here is our system installed here at HMAS Watson here in Sydney.

So the system allows trainees from the safety of a classroom to learn how to use sophisticated analysis systems to identify radar signals in the vicinity of their craft and then to apply sophisticated complex signal tools to analyse the signals and extract the attributes of the radar and work out what the transmitter was.

These projects are simulating highly complex communications and EW technologies, but those technologies also have highly complex interactions with other pieces of equipment and the warfighting environment. So we are talking about very challenging systems to build, and exactly the sort of job that the smart group, amazing group of engineers that are at the table over here– wave your hands guys – revels in taking on.

Both of these simulation systems have been delivered in the past year and received very positively by the Navy training schools at HMAS Cerberus and HMAS Watson respectively, and Navy has just issued a follow on order for Cirrus to supply further TACEW units to HMAS Stirling in Western Australia as well.

As an outcome of all this activity, Cirrus now has multiple high technology simulation training systems in place in ADF service, all of which have support and spiral development contracts in place.

So, after all this activity it now turns out that the defence engineering business with the most in-country experience developing complex simulation based training systems is now an Australian SME operating from Surry Hills!

Anna: That is quite a story and close to my heart, about technology, and great to see an Australian high technology SME not just compete but developing a leading position.

Peter: Yes, we are very proud of that.

Anna: How did the company manage to continue during that initial journey?

Peter: I am pretty sure in answering this question we are not alone. I suspect that tonight in our audience are many SME's who whether as proprietors, or maybe senior personnel close to the action, will have similar stories of challenge that they had to navigate. And, each would have their own story of what has carried them through that.

In our case what carried our team through was a real passion for developing technology in the right way, so Defence gets to get good kit.

Oh, and maybe a small dose of pig-headed persistence on my part played just a small role as well! Just a small role.

Anna: Even so, waiting 15 years for your opportunity is a pretty hard road. What were the reasons that you got held up?

Peter: There was a common thread that we heard over and over again that it was, supposedly, just too risky to deal with an SME to develop technology. Now, that assessment was clearly at odds with our track record, and I am sure many other fantastic SME's with amazing capabilities to offer the ADF face that same obstacle. Nowadays this is less of an issue for Cirrus than previously, but occasionally we still encounter this.

My concern in this area right now is not so much about Cirrus, but it's about the next generation of folk that want to set up technology enterprises. My hope is that all of us here together as a community, we collectively do not make it so difficult for the next generation to get going. That's not to say that success should be handed out, absolutely not; real capability has to be generated for the ADF end user. But maybe let's not make them wait 15 years for their ray of sunshine!

Anna: And what does the future hold for Cirrus?

Peter: Well, we have some pretty cool technology developments going on and coming down the pike. I am going to talk about innovation from one particular space that's a bit different from the simulation stuff, I'll talk about the sensor processing space. Pretty much all sensors have a common problem of how to find tracks from amongst a background of noise.

So, here is an example drawn from an active sonobuoy processing application our team has been working. Each one of the dots plotted in that display represents a bit of acoustic energy returned from the field to a sensor, the brighter the dot the stronger the energy. Now, those dots might represent a real platform, maybe there is a submarine hiding in that field, but then again maybe they're just background clutter.

The whole point of tracking is that you process all of the data, sift through all these dots and work out which of these dots actually belong together and represent a real platform, and which are just random background clutter.

Sounds pretty simple, but there are some problems with this.

The first is that a huge amount of effort goes into making platforms stealthy, so the amount of the acoustic energy that comes back might not be bright, might not be a strong return. We might get a weak return. To have a chance at finding stealthy contacts, you have got to be willing to look at really weak returns.

Here's what happens when you do that.

Things have gotten a little bit more difficult, as well as getting feint returns from a platform, you also get a massive increase in the amount of clutter and random noise that we have to deal with. Now for classic tracking this is a huge problem, because as the amount of points you process increases, the amount of computing power you need increases exponentially. That's a problem. So the choice that is always made is that you have to go back and process the smaller set of data, and that forfeits your chance to find really weak stealthy contacts.

Well, what our team has developed are algorithms drawn from the machine learning world that are much more efficient with the use of computers, so you don't have this problem, and you can process the larger set of data to find the weak contacts inside the data. We see this as breakthrough technology as this same problem crops up across sonar, radar and EW systems that the ADF uses to find stealthy targets. So we're pretty excited about where this may take us.

Anna: Hopefully, it won't take 15 years to get some traction! Thank you very much for that.