**Flinders University**

Fearless Conversations
Episode 2: DEFENCE
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**SPEAKERS**

Richard Price, Craig Lockhart, Paul Starick, Professor Giselle Rampersad, Jim McDowell

**Paul Starick** 00:06

It's about being brave in our thinking that how we drive South Australia forward in the future, and challenging yourself to position this great state for success. There is a series of villous discussion panels over the next 11 weeks on a range of topics, including high tech innovation, tourism, infrastructure, education, and health. For each, we have assembled a group of thought leaders to explore their views on opportunities and challenges. Today we explore the fence and how this sector will influence si now, and for years to come. Feel free to join the conversation through Twitter using hashtag villous conversations or in the comments section on advertiser.com.au. Thanks again for joining fields conversations. I'm Paul steric. editor at large with the advertiser, and I'll be facilitating today's discussions. Before I introduce today's panellists, I would like to acknowledge that we are meeting on the traditional country of the Ghana people of the Adelaide plains and pay respect to elders past and present. We recognise and respect their cultural heritage, beliefs and relationship with the land. We acknowledge that they are of continuing importance to the Ghana people living today. And we also extend that respect to other Aboriginal language groups and other First Nations. Now if I can introduce the panel. Today we're joined by Jim McDowell groups a nova systems. gl Rampersad Flinders University professor in innovation, Craig locker, Managing Director ba systems maritime Australia. And Richard price, Chief Executive of defensive say, Welcome, everyone. So let's start with a challenge challenging and harrowing subject, Afghanistan, a major defence ally, the United States. Yes, they all ended almost 20 years in Afghanistan, following suicide bombings, heart wrenching scenes at Kabul airport, and the country's folded the hardline Taliban. Today is the 70th anniversary of that anzus Alliance, which underpins our national security. It's good to start by asking you, Jim, how was the fall of Afghanistan changed Australia's defence environment and the United nighted states key role as our ally.

**Jim McDowell** 02:35

We think the United States has discovered the same that the British fine in the 19th century and the Russians find in the 20th century they're going to war in Afghanistan with a against regular terrorist troops is not is not a really a good idea and is highly unlikely to get you the outcome that you intended. My view that the United States went in for very good reason with regard to its ability to to catch those who bombed in New York and Washington. Now, the pivot for them, which everybody knows and acknowledges and foreign policy is with regard to the indo Pacific. So I think we need to get the Middle East somewhat out of our mind and start to focus much more with the United States and its core allies on the indo Pacific and the growth of the UN on the growth of China and the and the somewhat expansionism policies of China.

**Paul Starick** 03:33

Craig, do you have a view you are leading your project to build nine frigates that are obviously important in our Strategic Defence?

**Craig Lockhart** 03:40

Yeah, I think as Jim has said, they are you know, if you look at the geopolitical shifts that's been going away from NATO into, you know, Middle East and then into Afghanistan, and now into indo Pacific, by 2035. You know, we'll have half of the world submarines operating in the indo China Seas, which is why the programmes such as hunter are so important to the Australian Commonwealth is providing that capability to self detect, prevent through surveillance, you know, and and turn form. And I think know, as Jim has said, the us know, when in for their own reasons, and, you know, I think the face of that conflict is changed. we're much more technologically led through those conflict campaigns.

**Paul Starick** 04:28

Richard, do you have a view on that, that you'd like to share? Yeah, I

**Richard Price** 04:30

think particularly no maritime peace. History tells us if you look at Britain, Britain nearly lost the First and Second World War, basically, through having its trade routes strangled across the Atlantic, and nations in Asia Pacific and totally reliant on maritime trade. And so all nations are looking at their trade routes, saying how do we protect those if they were to be disrupted?

**Paul Starick** 04:54

So we've spoken a lot about the as a country about the security threat from China. Hell, what's your collective assessment of that? And how does it change? How does where needs change?

**Jim McDowell** 05:08

Well, I'm not a foreign policy expert. But you've got to say that China under its current leadership is an entirely different kettle of fish than it has been in the past. And we're moving back into probably a bipolar as opposed to a unipolar world with the United States being the only superpower. We now have the growth of another superpower in the in the east, which is, which is China, it clearly has some what we would call foreign policy ends with regard particularly to Taiwan, they added up for most and and that that island, that country is tied by treaty to the United States, we are tied by treaty to the United States, therefore it is an is that focus becomes inevitable.

**Craig Lockhart** 05:53

Yeah, I think I think Australia's position poll is a challenging one, it needs both are strong, but respectful relationship with China. You know, in the advent of any rising tensions, Australia needs to look for the capability edge. We can't compete on numbers. Therefore, we are investing as a nation in technologies. You know, again, it's it's about collaborative relationships with your neighbours, and defence cooperations as well to keep the regions safe and stable.

**Richard Price** 06:27

And I think that point that Craig just brought up about regional cooperation is so important. You know, clearly alliance with the US will continue, but we also need to build a stronger network in the region, because all of the countries are facing the same challenges that we're seeing

**Paul Starick** 06:44

if we can turn to how the shifts create opportunity for South Australian as defence industry. You've mentioned innovation and technology, how we need to build those capabilities, are you able to offer some feedback on how South is the opportunity for South Australia out of that?

**Professor Giselle Rampersad** 07:04

Well, we're very excited about the opportunity for Australia from these naval shipbuilding projects. In terms of RND it's an opportunity to upskill industry and the next generation in building sovereign manufacturing capabilities. Some of the, the, the initiatives that the prime such as ba maritime Australia and barked in with Flinders University and others around industry 4.0 and trialling advanced robotics and shipbuilding, which could have flow on benefits to SMEs and the supply chain, which could also benefit other sectors as well. So it is a massive opportunity for for Australia. And we know from COVID-19 that we need to be able to make more things here in to be can't depend alone on international supply chains. So in terms of the opportunities for our needs in the advanced manufacturing space, but for instance, at Flinders University, we have nearly every college at Flinders University participating in Defence Research from science and engineering, autonomy, autonomous maritime vessels, to materials biofouling and anti corrosion, as well as some research that we do with naval grouper around industry for and robotics and exoskeletons, and digital twins and so forth. And also the human side, the human sciences side and human factors, human performance, and so forth. So there's there's a massive opportunity for r&d and the supply chain as well. But also in terms of the skilling piece for the next generation and jobs in a wide range of areas from engineering and it and cybersecurity, to the business areas in terms of project management and logistics, but also taking the existing workforce with us. So last year, for instance, we ran a programme in collaboration with ba systems maritime Australia, the digital diploma that upskilled shipbuilders at risk at the end of the a WD project. They all now have employment within the hunter class frigate programme opv given a new lease on life, but this year we have over 100 people participating in the programme including from ba systems but also SMEs in the supply chain. You know, firms from Red arc to super sharp to century engineering and also stem teachers because the education piece is really important. And we have schools from north south east and west regional South Australia from on Gambia to river land participating to really grow the stem pipeline to be able to you know, have the skills needed for generations to come not only in defence, but in related industries.

**Paul Starick** 09:46

Just to change tack slightly but to pick up on what you're saying and Craig having been down to your shipyard it's quite striking that technology underpins so much of defence today versus anyway He went to the Collins class, construction yard 2530 years ago, it was much more heavy engineering. Are you able to describe that with particularly today's students in mind, and how shipbuilding or defence industry has changed? And what sort of jobs in particular they might be able to find?

**Craig Lockhart** 10:21

Yeah, Paul, like just says, I think we're in the midst of the technology revolution, you know, down at the yard, because hunter programme is 30 years, and it's like, we have three batches of three ships, it's highly likely that batch three will be significantly different from batch one. So we're investing in a technological future. So we have an overarching strategy that starts with the connected worker, the connected shipyard, the connected supply chain, a connected ship, not connected fleet. So we're using digital technologies to really change the way that we build ships. You know, you come down to our yard today, you won't see a drawing board. You know, we've got, you know, our employees winning kind of Google Chrome headsets, designing ships, in virtual space environments, we've got spot the Boston Dynamics dog, you know, trialling and shipyard environments, doing laser scans. We're using digital techniques to our paperless environment. So thinking about the journey that hunter will go on, and that capability edge back to that defence needs, then you know, Hunter will go through a transforming transformation in his own life. we all we all need to think about your future surveillance techniques, we'll need to think about future stealth technologies that makes the ships invisible. We need to think about high energy weapons, we need to think about autonomous systems, the ability for hunter to work as a mothership got, you know, managing lots of drones, both in the air and undersea. These technologies are in various stages of development, you know, and we're looking for the younger generation, through both direct employment with VA systems and the likes of Novell group, but also the SMEs to bring that that technology alive through our ship bill programme, so it environments changing, as you've seen for yourself, I know we've got robotic welders know, your direct comparisons between Air Warfare destroyer, which is the most recent ship build programme, we would have between three and 400 tradespeople building the first stages of the ship, we've now got 60 people doing the same thing. But we've got a much bigger support organisation supporting the technology that allows us to do things quicker, better, smarter, cheaper, which gives the fans ultimately more capability. So we're seeing a move from, you know, what you would call heavy trades type industry, to a much more professional engineering and software engineering lead, you know, opportunity that for, for for the youngsters, you know, the cofactors that 75% of the workforce at the end of hunter will have started in the primary education system. You know, we've got to make sure that we've got that science, technology, engineering and math and software and cyber coming through. But seeing shipbuilding, you know, and on defence is a real opportunity to drive no more than thinking.

**Paul Starick** 13:20

Which then Jim, is this true of wider sectors as well within defence?

**Richard Price** 13:24

Yeah, absolutely. I mean, we talk a lot about shipbuilding because it's a very obvious Yes, transformation of, of the state. But actually, if you look at other areas, such as information warfare, that is a massive uptaking for Australia as well, because it's no good just having warfighting capability, you actually need to understand what's going on in the world. And South Australia for the RAF base, Edinburgh is where a lot of that information is collected and processed. And so the growth in surveillance technologies from space from over the horizon radars, those sorts of systems requires, again, a very skilled engineering workforce that again does most of its work in the software domain. So they're designing complex systems in software implementing them in software, the hardware is very much off the shelf, you know, manufactured hardware these days. He the Collins class to train the sailors that are eventually going to go into the tech class. So the Collins class needs to be life extended. That life extension programme involves cutting the submarine in half, changing diesel engines changing electric motors, it's a very complicated programme, and what effectively comes out of that is almost a new submarine. So the life type extension is getting confused. I think we've Plan B in that so there will there will be over the next two years a significant upgrade. And the important thing is that provides the workforce to build the attack class so the people who go through Colin's will gain will be trained and developed or know generators, electric motors, propulsion systems that are going to go into the attack class,

**Paul Starick** 15:06

how long do you think you can reasonably draw out the life of the colons.

**Richard Price** 15:11

I'm not an expert on submarines, but it really depends on how many times during their life they've died and surfaced. So put stress on the hole. And so in terms of years, it's two, I would say these two issues is obsolescence of equipment. And that's what the life type extension will address. And then there really is how much life there is in the hole. And that depends on how much you've used, it

**Jim McDowell** 15:34

seems, also makes a nonsense of this argument that you would somehow do the life or tape extension somewhere else, you know, so we've taken 20 years to get the food cycle bargain, right? And it's very right now, we're not going to make it a little bit more complicated because it wasn't complicated enough, we're gonna do a life of hyperextension. At the same time, we're going to do an FCD Hi, Alice Cooper make it more complicated. I know let's move it to somewhere else where they haven't done it before. And I haven't got to work for us and so on. That's just not a nice view is just not an option.

**Paul Starick** 16:03

So when then when do you think it should be announced? You can't keep workers waiting and industry waiting forever? Can

**Jim McDowell** 16:10

Well, the fact is the full cycle dogging is done here. That decision has been given that reason was taken 20 years ago. Right. And whilst why start continues, you know, long mad, because if no one says I don't think that's what will keep happening. You know, if you're the incumbent, the last thing you want to do is force a decision.

**Paul Starick** 16:27

So essentially, it's a decision by default. It's a nurse that made the decision 20 years ago,

**Jim McDowell** 16:31

that the full cycle dockings would be done in Ireland, and that's where the facilities are for a lot of the work versus for and the biggest challenge we have to develop deliver the whole defence capability plan is workforce. And we've got to get a lot smarter or smartness is not dispersing 3000 kilometres away. I've got a deal.

**Paul Starick** 16:53

I might pick you up on the smart work operation of the workforce in a sec. But I think I should give Craig the opportunity saying we were talking about his project

**Craig Lockhart** 17:02

and fired Jim for being honest about presiding over a disaster. no intention of doing that. So as far as Plan B is concerned that there's no plan B i think the Minister of Defence and omens for hunter Yes, are are a step back of one milestone, which was the cuts steel, one ship one milestone. And for very good reasons. shipbuilding programmes around the world have taught us that you need to achieve a significant high confidence and design maturity before we go into manufacturer. As a result of the mandated changes that we're making around a combat system, the integration of a US combat system with a Saab interface into UK design ship, as well as we're only just getting the first of class in HMS Glasgow for the Royal Navy, consolidated No. And lambing you know that the the change requirements from that, then we've made a solid decision to unconstrained the ship one cut steel date and move it back such that we achieve maximum design rigidity, before we go into full manufacture. Now that's allowing us as an organisation, the Commonwealth, to default to an optimal build process for the ship, which we were unable to do, because we were holding back the sections that we hadn't achieved as a majority. But know that we can do that we're actually compressing the programme and achieving a higher efficiency. So I have absolute confidence that certainly in Hunter, you know, we're still following plenty, and plenty is the right thing to do and build it the right way. With the right information. Most industrial disasters, start by starting to build things before you've designed them.

**Jim McDowell** 18:48

I mean, that just I could list 10 or 15 or so it's undoubtedly it's a difficult decision. But it's undoubtedly the right thing to do to say we need a level of design maturity before we start to build this thing. Otherwise, you end up this whole rework cycle, and then you're rolling to catch up and then everyone's losing money and the attitudes deteriorate. And everyone becomes very confrontational. And the thing turns to custard very, very quickly.

**Richard Price** 19:12

In this country, we kind of we seem to think that we do these projects badly and nobody else does. And every single project in the world, which is as complicated as and difficult for this for the first time has challenges and issues and goes wrong. The only difference here is we develop we devote more pages of newsprint to it than almost any other country. I mean, that's significantly

**Paul Starick** 19:40

so so we should accept a degree of slippage because it's a major project in in a reasonable sense is what is what we're saying in programming. Not that

**Craig Lockhart** 19:50

what we're saying is we're reprogramming the milestones along the way as part of the journey. We're always subject to change because you know, change is a is is something that, you know, these complex programmes are susceptible to. So we change the milestones along the way. But we have to focus on delivering the capability to the Royal Australian Navy, you know, at the affordable cost when they require it. And that's what we're focused on, is the delivery of these batches of ships to the capability at certain points will change things along the way.

**Paul Starick** 20:21

So will net impact Craig Bay that people will work as we'll get hired later,

**Craig Lockhart** 20:27

what we're actually doing at the yard, as we've looked at, you know, we're we're on a two year prototyping phase right now, which is actually testing site to site top to bottom, the new shipyard. So were, you know, in the early phases, we've got four pole stations now fully occupied in the manual July, by the end of October, we'll have the first unit. So the first steel box moving into the outfit Hall, we're testing the digital information process, can we get the design to the workers? Can we get the equipment there at the right time does the shipyard workers it was been designed, you know. So prototyping is allowing us to test that, what we're what we're going to do is to bring some more of those complex, always difficult shapes. So the front end of the bow, we are typically shipped build programmes have got them wrong before we're bringing them into prototyping. And it's giving us an advantage to test these things before again, we go into cuts the also, you know, we we will make no one redundant as a result of moving the milestone back, we'll still move the people off the opv programme into 100. At the same time, we're still building up the trades in the same shape. And we're still working with the laser just sales team at Flinders to get our people through that digital, you know, education environment such that they're able to come into the yard, you know, with a with a new kind of sphere of influence. A question What,

**Professor Giselle Rampersad** 21:52

what what we need to do is plan how to effectively maximise the opportunity. We have such an incredible opportunity here in Australia, not only with the workforce with the supply chain with the primes and is how we use that opportunity, leverage our opportunity fluid flow on into manufacturing and into other sectors. And when we look at technologies that we are trialling with Craig in terms of industry for it's about improving productivity, safety, and so forth. So it is a unique opportunity for Australia to be world leading. You know, shipbuilding is a manual process globally. And we are trialling these technologies to actually set up the country very well in defence and other sectors.

**Craig Lockhart** 22:32

This may be the first programme in a large scale in Australia, whereby we are examining how humans interact with AI and technology. I know we've we've taken it for granted that we as humans, you know, can get along with decisions being made for us, you know, so we're researching at the same time as we're introducing new technologies to the yard, how it will change the working environment,

**Professor Giselle Rampersad** 22:56

yes, whether workers want to use it, how they would use it, how they will benefit from it, and taking that multidisciplinary approach that

**Paul Starick** 23:03

brings me to the question of how associated and other South Australian businesses can pick up on the opportunity. And I'm told that some of the primes are concerned that sa firms have not been able to gear up to become defence ready, partly because they lack finance resources and so on for the necessary investment. Is that correct? Is that a concern or not? And how are we able to maximise the involvement of existing and future South Australian and Australian businesses in these really important projects?

**Professor Giselle Rampersad** 23:37

while we do have some wonderful firms here, and you know, if you if I have a few examples of like, for instance, red archy electronics and super shark when I go in those rooms and see what they're doing, you know, you know, it's heartwarming, you know, they, they make things they manufacture things I see a lot of my past students, they're getting jobs in defence, wanting to work, you know, in that sector. So we have some really incredible firms, but there are also opportunities for them. So for instance, through the digital diploma, we have about 30, SMEs working with us from Super shocker red arc century PMB. You know, you know, many of them, they are opportunities, for instance, through the skilling Australia defence initiative programme. They've applied for grants to fund their their tuition, they are piloting the prototyping of solutions in their workplaces. They are industry associations like DTC defence teaming centre that we work with. So they are opportunities for SMEs, they are they're doing some really interesting things. But in terms of the gearing up the ramping up the digital enablement, they are hungry, interested, very innovative firms and you know, watch out watch watch this space.

**Craig Lockhart** 24:47

Arthur COVID support what I just said. I think we're, you know on record, we have absolutely no concerns about the capability of both Australian industry but also South Australian industry. I think we've spent and invested $8.3 million in a reception technology facility down at tonsley and Lane zero, to bring SMEs into their maritime environment for them to be able to get used to that, you know, everything from the contracting environment to the as built environment. We've got a number of accelerated technology programmes, you know, and what we call targeted tasks, where we're giving shipyard ship, build ship design problems out to industry, to allow them to respond in that real time environment. The hunter programme has two primary objectives ball one is to build, design, build and deliver the nine SW frigates, but the other equal objective is to deliver, you know, solving capability for them this nation in the end, we must be capable of designing complex warships in our own right, and having a supply base that can support that. Yes, that is challenges in the suppliers largely at iron to cyber environments. Yeah, but that as a challenge for all of us. And what we're seeing with the likes of Rich's organisation is a working together, you know, with the defence planes to try and, you know, I suppose, give the SMEs a leg up or support, and what that cyber environment reality might look like. And I suppose it's getting them fit for tomorrow's race. no issues with capability, what

**Paul Starick** 26:22

are the challenges in cyber in particular?

**Jim McDowell** 26:25

Because everything has to be has to be very cyber hardened? Yeah. And it's a it's a lot of ship, it's carrying around a bunch of zeros and ones. Yeah, you know, and you have to be able to harden that everything, even your invoicing system, you know, with needs, because that's the, you know, the, the way in the big companies computer system is through the weakest link, and that could be a supplier of 3d in 3d in the Japanese invoicing, through the same system with just a little word in landscape. So Australia's defence landscapes, very unusual in terms of its architecture, we've got five or six big guys at the very top VA, Lockheed Martin, Raytheon, etc, etc. Then we've got a million SMEs at the bottom. Right. And then we've got virtually nobody in the middle, like, Nova, who is Wando. You know, we are 330 million nearly 1000 people started by a couple of veterans 20 years ago, testing evaluation at its core, but a bunch of other project management and supply chain stuff. We need to build three or four or five of those companies in the middle of the SMEs can I create around because that is hired operator or has a balance sheet they can you know, that can invest that then that will employ that will employ people. So I think the sovereign questions, an interesting question because it can't just be about jobs. And lots of what Craig's saying is they're creating capability. It's not just in jobs. Ai sees about job sovereignty is about being able to do it yourself. And the only thing that something's if I look at the motor car industry here we have a thriving Morricone is very heavily subsidised by you and I and others. But whenever somebody else decided they weren't going to have one here, someone in Tokyo or someone in Detroit wouldn't have won anymore. So you've got to you know, you've got to build resilience here and where decisions get taken as to what really are your sovereign cables.

**Paul Starick** 28:20

That's the key to ensuring that the defence industry doesn't before the same fate as the car industry.

**Richard Price** 28:29

And and it's important, we stopped thinking about these as individual projects. Yep. To this point, this is about building up new industrial landscaping, not just for defence, but for areas as well. Yeah. And recreating those midsize firms that can then self invest and don't rely on taxpayers or primes to be continually investing nummy is super critically important, because that then will generate local sovereignty and local capability. The key though, I think, to that is understanding what is it that Australia needs to be it's going to be really good at what are we going to focus on? And what are the things that we're just going to allow the market to set up and I think there is a risk here that we focus on low hanging fruit, because it's easy, easier. We don't actually say, you know, what we need to be really good in these areas of technology are actually a bit harder. You know, and that requires not just industry but it requires government to say you know what, these are the areas we need to focus on

**Paul Starick** 29:26

you give some examples like what sort of industry is evaluation, electronic warfare.

**Professor Giselle Rampersad** 29:34

Electronic Warfare is actually an area that Flinders is involved in DST, the Department of Defence, defence, science and technology invested two, two and a half million in electronic warfare splinters, Flinders put in two and a half million as well. We have a few courses in it, but we also have research happening in that space. So electronic warfare is

**Jim McDowell** 29:54

Ew, we used to have a really strong nobody capability until the customer decided he wasn't going to buy it. More so effectively that it relied entirely on the Department of Defence. And whenever I VA, we developed a radar warning receiver called a alarm to steer the art defence in the end and want a bar of it. They want to be integrated Raytheon system on the airfare team. We went to defences, this will destroy the electronic warfare industry in Australia for a generation. And they say that's okay.

**Richard Price** 30:24

And this is the important part of sovereignty, everybody thinks is about making things. It's not it's about being in control of things. So things like electronic warfare, it's how you programme that box. And if you're not programming that box, some other countries, how can you be assured that you're actually getting the cages and

**Paul Starick** 30:40

define electronic warfare, presumably both offensive and defensive. So computer hacking and protecting against it, for example?

**Jim McDowell** 30:49

Well, if you take something like yoga, or example, you know, as a VA, well DSTV originally visualised the IWA defence industries, which was bought by Ba, most successful export programme, I think, in Australia. So this is a this, this is a tube that was launched off a ship that looks like a but looks like a ship, to Mercedes or electronically, it'll have a signature, and it will seduce the missile away from the ship into this fake ship, if you like. So there's an example of defence of electronic warfare.

**Craig Lockhart** 31:20

And it's not, you know, autonomous systems as well, or it's not, it's not the platform per se, you know, most ugvs, you know, and there's a whole variety of international competitors, who private provider, the sovereign capability is to have the intellect, the knowledge, the know how and the artefacts that pose, the control systems, the mission systems, the guidance systems, that is the heart of these platforms together, you know, as Jamal referenced that Leon Hunter is just the boss, to be able to deploy the capability. The sovereign capability that we need is the intellectual design and control and guidance that ew systems

**Professor Giselle Rampersad** 32:00

and a lot of these technologies that actually have applications in a range of sectors. So when you look at autonomy, for instance, autonomy, yes in defence in terms of maritime autonomy, land, vehicles in the air, and so forth. But it's also applicable in other sectors, you know, driverless cars or looking searching the ocean for marine biology, or in space, and so forth. So when you have a sovereign capability, it actually flows on into other sectors, I could take a technology a format tonnes of a micro x, they do X ray technology, so they work in defence, you know, in terms of baggage scanning, and so forth, but also in medical devices, you know, in ambulances for stroke victims. So it's about the building a sovereign capability and innovation. It really benefits a range of sectors with with with intergenerational programmes like hunter being a catalyst for the growth and development of these industries. I'm a non executive director of macro exercise, okay. I have no, no stake in the company. It's just a really lovely, innovative company.

**Jim McDowell** 33:06

If we come back to test evaluation, I know I'm banging on about this, but it is a kid as a capability which runs through from the start of a programme to the end of the programme. It's not a vertical, it's a horizontal and a place. Every environment, Lanci or joint that applies that you saw, in that case, it's ubiquitous. It goes from start to finish and not PSS engineering. So we had better and this country have the capability to be able to define our requirements, how are we going to test them, I went for all of these verticals. And that is the space that that Nova start that that's really the core of ARB is is testing, evaluation, certification and systems assurance, that and that is a CPS, solar and industrial capability priority. It's the only horizontal the rest of I cos a horizontal prime. I made that word up. And I think it's really it really is a case that that that is a simpie that we need to invest in when we're

**Paul Starick** 33:58

talking sovereign capability. Nuclear, we've got two people with nuclear backgrounds here. Craig, he worked on maybe three. You worked in the British nuclear submarine programme? And should Australia establish a nuclear industry to enable nuclear powered submarines and other particularly say environmental, when you extend to nuclear power stations and so on, but particularly with a defence focus?

**Craig Lockhart** 34:31

I think that's a big, that's a huge question, Paul. And I think it's a question for the entire nation, because it is so emotive. You know, the word nuclear now has all sorts of angles to it. But, you know, I can only speak from my experience in the UK perspective, but most developed nuclear countries, you know, have been in them for a long time and have taken a view whereby they've, they've spread the economic investment and the risk of a nuclear probe. Arma costs energy across ways the cross re reprocessing propulsion, because it is a significant investment. And it will take almost a generation of education, I think in Australia to get us to the point that we might be comfortable as a nuclear nation dweller of you know, whether our submarines require nuclear power propulsion, the only advantage that it gives them, then is the ability to, you know, perform endless amounts of operations with, you know, an infinite range capability. It provides no other capability now, and not really for the Commonwealth, and for a Royal Australian Navy to determine whether that capability gives them an edge based on the role that they've determined for this nation submarine. It sounds like it would.

**Richard Price** 35:50

Yeah, but I think to Greg's point, it will take a generation to get there. Yeah. So the question you got to ask yourself is not? Is this a technology solution? It's what technology solutions are going to be there in 10 1520 years time. And so that's the problem I want. And all

**Jim McDowell** 36:05

you've got to say, we won't be operating on our own. Now, without being with the Americans with the brainstem. These guys all have nuclear submarines. What edge does the electric submarine give them? What can I do like the submarine is much quieter when it's not running as engines, and nuclear reactors running all all all the time. So those things need to be need to be balanced. And my Joe, and I have chairman of ansto for five years, and we have a little reactor up there, which does mostly by 50%, research 50%, producing medical isotopes. And the key argument now is not about nuclear submarines, it will be about environment, it'll be can we get to these very ambitious targets now, without embracing every form of non fossil fuel energy that we can write? And I suspect they are they answered, and that's gonna be no, we're gonna have to annoy you've got the breed of small modular reactors coming along with just on the horizon? I, I think that's a much easier question the answer as quickly as you can start doing something. And then as you get more confident, then you can start to build it out. And there's something vaguely immoral about digging yellowcake out of the ground and selling it to people. You know, it's a bit like dealing in hair, you know, dealing in marijuana sort of thing. You're not smoking it yourself. So there is a there is a moral, there's a moral danger there of all that, that we need to address.

**Professor Giselle Rampersad** 37:31

I think there's a broader question on industrial development. And we started, you know, tackling that a bit earlier. So, you know, you asked the question about the nuclear industry, but there's so many industries that can grow based on existing strengths based on related strengths out of a shipbuilding programme. You know, we started speaking about advanced manufacturing, how you could roll out, roll over into the supply chain and really build reboot manufacturing in Australia in terms of the digital capabilities of firms, but also in terms of related sectors, like like medical devices. So there's, there's a range of industries that can be catalysed through shipbuilding. So rather than just focus on one, I think, broader,

**Jim McDowell** 38:13

and micro x is an X ray company at heart, it's radioactive X ray, you know, it's for the chores,

**Paul Starick** 38:17

what what sort of research and development has been looked at in in this sort of sector is, for example, hydrogen is big at the moment, is there any hydrogen application for Defence?

**Jim McDowell** 38:29

Well, that mean, insofar as you can use hydrogen sales to power to power things in cars, and chips, and everything goes obsolete. And if you look at Japan and Korea, they've already set their hydrogen targets, I've already sent them rice for a pint or a kilo of hydrogen and they intend to power things, cars, bosses, you know, ships, everything, maybe aeroplanes, as well as hydrogen.

**Craig Lockhart** 38:51

You know, we don't often put hydrogen close to weapons, or, you know, I'm not sure at what point but, you know, we are looking at future battery technologies, you know, as just as was suggested, you know, you know, in opposition to that nuclear question, Where will battery technology be in 30 years? Where will we be on electrical accumulation? Can we store energy in different ways? Can we store it in materials, products and skins? You know, where will we be, you know, with higher energy weapons, you know, laser technology, all of these require and have the potential to play replace, come propulsion sources. And so we are continuing to invest in the only shipyard problems. So, what we're doing with Flinders, we're focusing now on typical ship, build ship process problems that we've that we've encountered and encountered for the last 10 to 20 years. And we're trying to stimulate the industry, the SMEs, the academics, to think of ways for us to get around these problems, but we are also investing in the long term that says, Where is future technology is likely to take us you know, in energy propulsion autonomous systems Ew, that avoiding conflict is the best way, you know of, of actually stem stimulating the technology growth. And we we continually toggle our minds to different technologies that allow us to do that.

**Paul Starick** 40:16

What's looking prospective, then? What what sort of technology and so forth are looking prospective.

**Professor Giselle Rampersad** 40:21

As Craig mentioned, you know, these these shipbuilding projects, they occur over several decades. So in terms of the initial RND, it's around the ship, the shipyard capability, so industry for when robotics and so forth. But in terms of the next generation of technologies, ew, autonomy materials as well. So there are a number of nanotechnology researchers at Flinders that look at energetic materials and battery storage, there's their firms that make batteries in Adelaide like PMB defence, there's actually organisations that do hydrogen technology at tonsley, as well. So those are, I guess, along the horizon. And as the shipbuilding programme moves further on, this sort of r&d will sort of evolve with it.

**Craig Lockhart** 41:10

We just announced this week, Paul, project cuttlefish, which is a collaboration between VA systems and DTC whereby, whereby we're looking at ew type technology where we can make the ship's profile the ship invisible to other detectable systems, you know, so it's again, it's a bit like NACA, we throw something up in the air, and it attracts a muscle, but, you know, this technology through a combination of radar systems technologies, has the ability to make ships invisible, you know, and that's, that's, that gives us a real edge.

**Jim McDowell** 41:46

Right, right now, you know, I bet I bet the Craig's programme will use much more model based systems engineering for testing evaluation than you would ever have done in the past. Right? Yeah. And that's a technology that's grown over the last five or 10 years or something like that, that allows you that allows you to use digital techniques to test things rather than, you know, going over your, your hammering your micrometre, whatever it is.

**Paul Starick** 42:10

I'm talking of skills. And obviously, we've got close borders at the moment, which makes importing skilled workers difficult making it more important than ever that we grow our own skills base. And what's your collective assessment of the skills pipeline in South Australia are returning here? Are we producing? Should I say, Enough graduates? And are we targeting primary schools?

**Richard Price** 42:35

I mean, it's not just a South Australian pipeline, it's a national pipeline. And the first thing I'd say, I think, is a whole country faces this challenge of producing enough people with the right skills. It's not a matter of just putting people through the education system, we actually need a cadre of people we've we've experienced, who can develop people as they pass through education. So we can, over time deal with the supply side in terms of more people passing for education. But in the short term, we absolutely need more experienced people baybay from other sectors, or from international to train, develop and mentor, the upcoming car drove Australia, we

**Paul Starick** 43:15

shouldn't be scared of importing, skilled workers

**Jim McDowell** 43:18

should know how to get them at the moment's border. So that's, you know, that's something that will might be something we've relied on in the past. So the other edge of, and I agree with everything that Richard says about what we need to do, and the experience and growing people and more people in STEM and all that. But for the here, and now we need to get more efficient with what we've kind of got what you got. So let's get more efficient, let's get some more productivity over the people that we've got. So we should be focusing very strongly on that. And contracting model should reflect that, as opposed to a bunch of sort of input contracts which attend together.

**Paul Starick** 43:49

What do you mean by that? How do you go about doing that.

**Jim McDowell** 43:51

So if I take professional services, I could take an angle, take professional services. So what ideally, what I would be contracted to do either department of finance or anybody else's, produce this output for me, not give me these five people in these seats from nine to five every Friday, and we're going to pay in that basis, right? That is a very unproductive way to manage human resource. It's a very traditional way to manage human resource, unfortunately. So that's just like a small example of Hi, you know, Jim, I want you to do this task. I don't care if you employ 50 people or two people, this is what I think the task is worth. I'm gonna pay it I'll figure out because I got this thing called the profit motive as well, that do this thing most efficiently in order that you know, my my Adam Smith, my my ANOVA Alan Smith is a moral philosopher. He wasn't an economist. So

**Paul Starick** 44:42

would would you expect union concern about that given particularly blue collar unions at shipyards

**Jim McDowell** 44:49

perhaps but the fact is, everyone's going to get a job. The candidate wants a job in this industry that

**Craig Lockhart** 44:54

is qualified to do it. Not that that's the wrong question and unions are absolutely one way to do point to make no of cotton, you know, deployable workforce more productive, is to look at the way that you know, because we have, you know, a lack of incoming kind of foreign students and you're an overseas visitors at the moment is as a way of targeting, or investment of time or energy into much more focused curriculums. What we are trying to do in shipbuilding sector is to have a national supply architecture that says, look, choices have been made by the government that we're building submarines. We're building ships here in Adelaide. So let's set the state up with its engagement through both government, industry and academia, the focus on advanced manufacturing technologies and curriculums, let's look at East and West, you know, for integrated logistics, support networks, and digital were those those pools of students that can focus on that, let's look at Victoria for systems engineers, and combats, because again, we have the universities with the right curriculums. And it's it's encouraging a level of collaboration and not competing for the same students and the same, because we don't have the luxury know of the depth of that resource because

**Paul Starick** 46:09

this being done at the moment, or does it need to be done?

**Craig Lockhart** 46:11

I think I think we are working with both the you know, what we refer to as the the university vice chancellors, and with Department of Education and defence, we're using the ship bill programme as a catalyst to change and influence that thinking. But we do need to think about, you know, how we make our current pipeline of students, apprentices, adult learners, veterans more productive by targeting our investments in key skills, regions for this country by being more focus by being more focused,

**Jim McDowell** 46:44

and Department of Defence ism, an optimistic buyer, right, as the only buyer of defence equipment in Australia, everyone will be pleased to hear so so is the demand side, it is the only demand side for defence. So if you've got that sort of market power, you need to use that market power to ship the supply say, to an extent that we haven't in the past, we've kind of said let the market sort that out. Every other you know, advanced defence economy uses much different mechanisms to do that the United States has the Buy America Act, the ATAR small business set asides, the ethnic set aside a lot of industrial policy, France solves that easily. It's both the buyer and the seller, with owns the companies that it's buying from. And we an Australian need to get our minds around a much more activist industrial policy, as opposed to the marginal sort of like so.

**Professor Giselle Rampersad** 47:36

So I think on this skilling piece, it is multifaceted. So as Richard pointed out, yes, we need to, we need to use our existing workers in terms of upskilling existing workers and through the digital diploma, we have, you know, the existing workforce from their 20s to their 50s or 60s, upskilling. And we taking people with us, but it's also in terms of the younger generation, not only those at university, but in schools. So the skilling piece, it's a pipeline, it's the education system and having that partnership with the schools, but also with the university sector. And, you know, it's a national thing, you know, so yes, we need more engineers nationally, for Defence and for other sectors, engineering, it cybersecurity, but also in the social sciences, for management, project management, and so forth. But it's also that partnership, what do you go into? What are you going to do with the here and now and give people that experience, and we could look at innovative models, for instance, through degree apprentices, where they could work and study at the same time, so they get that experience as they're studying. And that's where partnership between industry and universities come together. And also between the university and the vet system. So one of the programmes that we're running through the digital diploma, we have that partnership with with Chief SC with the vet system, you know, new innovative model, which has not been really explored in a lot of depth before because of the funding systems. But but we'll be able to, you know, start exploring that it was successful. We took people through it was awarded, you know, training and mentorship programme of the recently on Friday, the SS SS skilling awards. So those new innovative models that give people work experience, while this study could help in really providing that capability,

**Paul Starick** 49:24

I just want to clarify what you're all seem to be saying regarding an industry policy and a skills policy. Are you saying for example, that some states need to focus on a particular area like they might produce chemical engineers and other state might produce at a university level and other state might produce electrical engineers or should we be that directive in that targeted about how

**Jim McDowell** 49:50

the system works, think the market and the end is will be that will be the movie as a sort of solution provider. But where are you in defence Protect land, we're talking about defence here. Where you are the market, you are the total market, you've got to use that market power and a much more industrial policy directed way than is currently happening

**Paul Starick** 50:12

in by telling people or, or by spelling out what's done? Well, I

**Richard Price** 50:16

think it comes back. We talked about sovereign capability, it's about working out, what is it we're going to do? Yep. And the market will sort itself out industry, once it sees the signals will respond to that. The universities will respond to those signals. It's that element. And it's also then taking a programmatic view across the programmes, not running them as individual projects, looking across them and saying, you know, what, instead of using five different types of equipment on across our fleet, we need one across the fleet, those sorts of things give scale, they'll focus, people's investment, and industry will respond to that, but it needs clear signals.

**Paul Starick** 50:53

So, Craig, is that? Just to clarify, that's your position? Oh, yeah.

**Craig Lockhart** 50:58

I think, as Jim has said that, you know, defence is, is the market and we are the fence. So what we're what we're proposing is that national architecture that says, with Targeted Investment with with the right support, and with collaboration at the heart, rather than competition between academic institutions and industries, then we can get bigger bang for buck, we can get more students with, you know, greater focus that serves the needs and the demand profile of our programme over the next 30 years. You know, and and at the moment, we're, we're being robbed of that because there is too much competition and choice, you know, and we are diluting the portfolio, which, which denies us the right people at the right time.

**Jim McDowell** 51:40

And this is a national security question as well. It's not just an economic and industry efficiency. It's a national security question, because that's the that's the role of defence to provide national security. I'm

**Richard Price** 51:51

supposed to be a fearless conversation. So I do worry that we are actually narrowing people too early in our education system at the moment. I mean, I look at my own experience, I wanted to be a pilot discovered I was short sighted, what the hell am I going to do? I do electronics engineering, that's the way of the future. And that was literally the sort of decision making process I went through, it seems to me now we're trying to force people to make choices too soon about where they're going to end up. And certainly the most valuable engineers I ever had in my organisation, were the broad spectrum engineers who could turn their minds to lots of different things, and weren't frightened to take up new challenges.

**Paul Starick** 52:30

Do you mean at a school level or at a university all the way through the process? subject selection, and

**Richard Price** 52:36

yeah, and, you know, the number of courses is confused, you know, confuses me a number of choices people have

**Paul Starick** 52:43

overcome that you're suggesting by narrowing the focus and narrowing Well, no actually broadening yet broadening people. So that narrowing the amount of curricular on? Yeah, not yet.

**Craig Lockhart** 52:54

Which is why I think, you know, just outside earlier on, that we've got no teachers going through the digital diploma, I think that's a fantastic thing. No, we have, we can influence teachers and parents, similarly, in the new generation of technologies, and the opportunities that advanced manufacturing will give us here. And not just for shipbuilding and defence. But think about those, you know, what I'd call a bridge sectors as well, space, cyber, you know, it's the ability to change attitudes, but the early phases that says, you don't have to make those choices now. But making a choice in science and technology and engineering, and maths is a good foundation discipline.

**Professor Giselle Rampersad** 53:37

What we have to do is to build a conference in schools and teachers to give as many opportunities to young people as possible. So what we have noticed over the years is those schools that come through to do engineering, for instance, at Flinders are those schools that offer CAD or computer aided design, and not many schools do that I could count the numbers on my hand. So by equipping teachers with CAD electronics, robotics, then they could understand what engineering may be about and actually, at least open that option to students that may not be exposed before. But to draw on what Richard is saying, for instance, we have this first year engineering common across a range of areas so they could choose what type of engineering they go into. But he has that multidisciplinary approach of giving what is traditionally a stem area, a taste of what human factors are about and vice versa, that but that would add depth in terms of having an overall broad approach to problem solving in general.

**Richard Price** 54:33

I suspect if you went across this panel and said, we've your big projects have got wrong, what was the most important thing? And I bet you it wasn't a technology, it will be all about the people and the interactions of those.

**Jim McDowell** 54:45

Yes, I'm either a very bad example or a very good example. Yeah, but I'm, I'm a lawyer, he has always run defence and aerospace companies. So I don't know it's not a good thing.

**Paul Starick** 55:01

Are we drawing to a close? But we do have a question from Damian on Twitter, with all of the work needed in defence and the skill shortage? How are you attracting talent to take on all this work? And how effective have they been?

**Richard Price** 55:14

Well, that's one of the reasons we're investing so much in the space sector in South Australia, because what we found is, you know, coming back into schools and teachers, space really attracts kids to take up technology subjects. And as long as they go through that stem journey, when they come out of the pipeline, and they've got these options to work in defence in space, you know, that really opens up the aperture from them. So, you know, there are initiatives that will help the defence sector that aren't immediately seen as being defence initiatives.

**Professor Giselle Rampersad** 55:46

Yeah, spaces cooled spaces sexy, but what for what we have noticed is that the young generation, they actually quite open to defence actually want to work in it because of the job opportunities there. You know, I go through, look at the number of students that go and do work experience or go into graduate programmes from ba Lockheed Martin, red arc, super shark DST. A lot of our students, we have observed that Flynn has actually gone to work in defence, they want to work in defence, we actually had the largest number of students in Australia that participated in the Nicola border programme, funded by the French Embassy to actually go to France before COVID-19. Woman as well. So we've had a few of our students gain scholarships from the woman and stem scholarships to fund that undergraduate study by the Department of Defence. So our students actually embracing the opportunity to get into defence. Now, there may be some some questions on young people. And I think it's, it's a branding thing. You know, defence offers lifelong employment, secure, sophisticated jobs, and also focusing on the profession because a lot of these professions, they offer broad opportunities across a range of industries, such as engineering IT project management, so their careers could evolve with them, but also focusing on some really cool technologies. So robotics, game development, VR AR to really attract young people, and then they can apply those technologies to space or defence or to medical devices, or what have

**Paul Starick** 57:20

you found that overcomes there is some that have the moral view that defence is the industry of death. Do you find that those things that you've mentioned, overcome that moral view, particularly with young people,

**Professor Giselle Rampersad** 57:33

I think we have to remember, it's about defence. So the fact that they could go out to the mall, go and enjoy the beach to go out and socialise with their friends, it's because somebody is defending their society and community, the fact that they could go on social media and not have to worry about you know too much about cyber security is because somebody is looking after them. When we see images on television or news. They have that freedom in Australia. And that's what defence is about to actually in power and give those freedoms. Some people will have that a few minutes, not perfectly,

**Jim McDowell** 58:03

you know, perfectly legitimate food at home. And my, my experience has been a very minority view that, you know, defence is seen as a shrine in the United Nations Charter, nations and ability to defend itself. And as my father used to say, I'm really glad somebody invented the Spitfire would have been an entirely different situation.

**Paul Starick** 58:24

Unless anyone's bursting to have something to say. I think it's about time to wrap it up. Thank you all very much for participating. Thank you to the audience for watching. And you can read all about it in the advertiser tomorrow, and of course, the Sunday Mail on Sunday. Thank you very much.