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**Air and Sea Integration: An Industry Perspective**

Good Morning everyone.

Firstly, thank you to the Williams Foundation for the opportunity to speak today.

BAE Systems are proud to be associated with the Foundation, and we've always appreciated the work they do in bringing the aerospace industry and Defence closer together to discuss our current and future challenges and opportunities.

As was mentioned, I have been asked to present today on industry's perspective on Air and Sea Integration.

I am going to tackle this topic from a few different angles, focussed on the challenges industry and defence face together, and then, what industry can and should be doing to support the ADF in maximising their opportunities in integrated air and sea operations.

Like all major Defence prime contractors, BAE Systems has a keen interest in maximising the interoperability of our platforms and systems across the air and sea domains. We see the operational and financial efficiencies that can be achieved first hand, and we are just as eager as Defence to see companies engaging effectively with each other, and with Defence to proactively identify opportunities for better integration at a whole of capability, and at a component level.

Over the past few years we've seen a focus across industry on developing and adopting open standards and architectures, and this is an evolution of the standards-based approach the major industry players have always supported. We've seen good leadership from NATO, the UK and the US in individual areas with regards to setting standards and in some instances moving towards open architectures.

And across industry we really do realize that the effective integration of platforms and systems into the joint battlespace is a critical component of our work now and into the future.

From a BAE Systems perspective we see this as hugely important across all of our future large programs, and open architectures are the core of our approach to programs such as JORN, over the long term.

From an industry perspective, open systems architectures, support to collective air and sea training, and enterprise level C4ISR capabilities are the key areas where we can really make a significant contribution to air and sea integration and interoperability.

In terms of the role we play, I see three key areas. And I want to go into each of them in as much detail as time allows. Discuss the challenges we face together. Highlight some examples of our success and failures to this point, and then discuss briefly where industry can best contribute to each of these areas.

First – on-platform integration. This is the challenge of having the discreet systems and sub-systems aboard an aircraft or a ship work with each other seamlessly, in a way that has been integrated with minimal overhead. This

could be as simple as an EW sensor suite having a single, standards-based data stream which will talk to a weapons suite seamlessly, while also allowing the data stream to be reused by embarked intelligence operators or potentially sent off-board to another platform or ISR capability. This is where platform-based open architectures are the key to industry cooperation, and the buy-in of major platform builders is critical, as is close cooperation with equipment OEMs.

At its core, this is about industry delivering a sensor as a service across a platform and the wider integrated air/sea enterprise.

The second – off-platform integration. This is the challenge of developing architectures and capabilities which allow platforms to exchange data directly with each other, and in a way which best enables real-time tactical operations. This is where we need a continued focus on consistency in our data links and communications in contested environments, our multi-level security and data exchange systems, and this is where industry and the services need to work together to define and agree to approaches to interoperability in Australian and coalition environments.

And the Third key challenge for industry is enterprise-level data fusion and distribution. We need to finally embrace the technical and security challenges posed by large volumes of data being collected, processed and disseminated in Australia and in deployed environments. We need to work with Defence to identify innovative solutions to ensure data is available when, where and in the form it is needed.

And importantly we need to work in a defence and industry coalition to define architectural approaches and standards together – and not see major ISR data

exchange and backbone requirements as traditional defence capability programs to be delivered by one contractor as a single 'big bang' approach.

To look at the first challenge and the resulting opportunities in more depth. In industry, we see a lack of a cohesive long-term plan for platform integration, and not just in Australia. As we all know, both Air Force and Navy face a significant and unique challenge. You got everything you asked for – now we all need to make it work together.

But we didn't acquire these next generation platforms in a way where they were designed to be integrated from the start. In some instances I know that's not true – there are always exceptions. But, broadly – the lines and lightning bolts between platforms in an OCD's OV-1 picture rarely translates into firm requirements and an operational capability. This is the disconnect sometimes seen between strategy and a program's technical requirements and execution.

If you look across the ADF's new and future suite of platforms, we see industry leadership from BAE, Raytheon, Boeing and Thales – but we don't have a joined up approach across our companies of the standards we want to move towards, we don't have a particularly coherent view of the common equipment across the fleets, and we don't yet have a shared vision across the major contractors and defence for where we want to head, how we want to influence standards and architectures in Australia and overseas, and how we can work together to ensure that our work as platform AND system and sub-system OEMS, and remember we all are each of those things, but how that work can be done in a more cohesive way which is from the ground up designed to support greater integration and interoperability across Air, Sea

AND land platforms. Rather than the way the challenge is approached at the moment, where Defence mandates requirements and standards, or they are locked in simply by the existing interfaces of the major systems.

What we'd like to see is that shared vision, not mandated by Defence, but built collaboratively by Defence with the leaders in the industry.

What we'd also like to see is on-platform interoperability, ease of integration, and open standards and IP transparency becoming more of a focus for Defence in making procurement decisions around future platforms and systems.

Or, as a great thinker in the defence industry once said – “it's about putting the glue first”.

One example where this has been approached very well by industry and Defence is in Land 121 Phase 4, the PMV-Light. The C4ISR requirements of 121-4 and the future integrated computing system is a great example of where industry and defence have worked together to ensure the platform OEM is able to access the information and capabilities needed to test, demonstrate and build an architecture on the platform which is designed to allow seamless integration, from a wide range of equipment providers, easier upgrades and more efficient data management both on and off the vehicle.

This has been achieved by adopting and tailoring the UK GVA standards, and working in very close cooperation in early design phases across Defence, major industry and OEMs. As a result, new capabilities can be brought onto the 121-4 platform quicker, cheaper and more reliably – because it wasn't a matter of one platform OEM providing their own closed system, and Defence didn't mandate a standard onto industry. They worked together, and developed a workable architecture through broad engagement.

The second opportunity for Industry is off and inter-platform integration. This is the direct integration of systems across platforms through automated data exchange.

This is one of those really challenging technical problems. Where industry can and should play a critical part.

We have seen the challenges of off and inter-platform integration most pronounced in Army. But this is an area where both Navy and Air Force have worked hard to tackle head on over many years, and where our allies including NATO have developed and adopted a thorough set of standards. But as the joint air/sea battlespace and capability becomes more complex, we need to evolve to another order of those standards and our implementation.

One of the best examples of where the challenges of this aspect of interoperability can take years to resolve is in the ARH Tiger program. For years, Army has struggled to effectively integrate the Tiger's electronic systems into their force, and it is now taking greater and wider industry involvement to try and resolve the challenge most effectively. Likewise, we have seen Army face some significant challenges in the integration of their chosen battle management system.

What we need to ensure moving forward is that when we select a capability – a platform, a sensor, a piece of software, a battle management system – that we think incredibly hard about enterprise integration and modelling. And it's great to see Defence's thinking is changing to embrace a systems of systems approach.

It's what Australia, and our key western allies have done for F-35. We know that a fifth generation platform of that complexity generates and consumes enormous amounts of data – more than anything we've ever seen. We know that its supply chain is complex, that its ability to interoperate with land, maritime and other air forces is a critical aspect of its performance and the capability it brings.

So, it is great to see that the integration of F-35's systems with Growler, Wedgetail and other platforms is a key driver of the work being performed to bring the aircraft into service.

The major industry players have had a crucial role in bringing F-35 into service in a coherent, effective way and which maximises its integration with other platforms and forces. BAE Systems is one of the major partners in the F-35 program, and we build tail assemblies right here in Australia. We also have staff working on the enterprise modelling of F-35's introduction in Australia.

But, the best example of where industry can work to support the introduction of new platforms is in the UK. Through the Agile Thunder program and our systems integration lab, BAE Systems and our industry partners are working in close and ongoing cooperation with UK MoD and the US to support simulation, modelling and integration efforts of F-35 with other platforms.

This includes working with MoD to model operational concepts and TTPs in more realistic scenarios. And which also allows for achieving LVC training outcomes.

Our approach is to work as an industry team to deliver the outcomes needed by Defence through initiatives such as our systems integration labs – housed at

BAE Systems, but used by RAF, other UK services and our broader industry partners. And this is a model which we believe the ADF could adopt for future platforms and systems.

By having industry operate in systems integration labs in a cooperative way – not in a way where the price of entry is surrendering IP to a competitor, or where an integration lab is cover for a BD ploy – we can see that if we work cooperatively we can assist Defence to identify the barriers to inter-platform integration, the technical possibilities for overcoming those barriers, and we can actually model inter-platform integration in a much more coherent and planned way.

This is where industry can play a really critical and joined up way to support programs such as Plan Jericho.

Raytheon are certainly setting an example of where industry can be on the front foot in working with Defence to pursue opportunities in future systems integration, through the opening of their exciting new integration facility in Adelaide. It's great to see that investment is being made in working to address critical integration challenges, and that Raytheon are actively engaging with their industry partners to make solving some of these challenges a reality.

The third industry role is in delivering greater air and sea integration at an enterprise level. The integration of data, sensors and the delivery of real-time ISR and C4 fusion and analysis.

This is unfortunately not a challenge any country has resolved. If we look at the US example, we see half a dozen D-SIGS and other ISR fusion programs, for everyone from JSOC to INSCOM.

For Australia, we have programs such as JP 2096, which will hopefully and eventually deliver an ISR backbone, delivering some of the upstream integration we need.

And 2096 will no doubt deliver an architecture and standards which everyone in industry will support, and can work to.

The challenge we face is that there are global capabilities available in major programs, minor programs and everything in between across the five-eyes defence and intelligence domains. Government has a leading role in securing the latest and best capabilities and architectures for ISR integration, but the major defence primes are the key to accessing that.

We have people on the ground across these programs – we have regular access to our own internal people and capabilities around the world – and as a former government type, I can assure you that in many instances Australian industry has greater access to and understanding of the knowledge and technology within allied ISR programs than government does – because our companies are delivering them.

This leads me to a key point. The major defence companies need seats at the table within Defence when ISR and data sharing architectures are being planned and designed. And I'm not at all talking about industry associations, SMEs, or consultants.

The depth, breadth and unrivalled global access of the major defence primes will be critical to Defence achieving the best air and sea integration outcomes – and we would like to work more closely and more collaboratively with Defence in the planning phases. It's great to see First Principles, the Defence Industry Policy and the White Paper address this very issue – but we need to ensure we maintain momentum and truly work together in a partnership moving forward.

And we need to work to change our thinking beyond above and below the line work. We should borrow from US examples of where major defence industry companies can, and do work together to deliver the best outcomes for their customers, without fear of being excluded from future work.

DI2E or the Defense Intelligence Information Environment is a great example of where industry is trusted to work as a team to deliver integrated capabilities – in that instance, for US intelligence. We work together to design architectures, we prototype and rapidly develop new capabilities for other companies and agencies through mechanisms such as Plugfest, and we then work together to deliver the needed outcomes to our customers.

One other area where major industry players are critical in delivering a joined-up ISR enterprise across the air and sea domains is in security.

As we are at the forefront of Defence's supply chain management, we need to work together to ensure the security of Australian and overseas SMEs and OEMs, and we need to work together with Defence to establish a robust framework for verifying the security and integrity of data and components as they move around what are increasingly complex and globalised supply chains.

BAE Systems has one of the finest examples of an internal security capability globally, and we work very closely with the cyber security communities here and overseas to identify and report threats and attacks. We need to ensure that this same focus on threat detection and intelligence is applied across all aspects of our work – which Defence and the Department of Industry are moving towards, and which we very much support.

Some great work has already been done in this space, and it's an aspect of industry's work which we are all really passionate about.

In summary, if there is one message you take-away from this, it's that industry is passionate about enabling greater air and sea integration, and that the major defence companies are uniquely positioned to help achieve the maximum value, integration, and interoperability of our platforms and systems.

Thank you.