APDR EDITOR, **KYM BERGMANN**, SPEAKS WITH **PROFESSOR CRAIG SMITH**, CHIEF EXECUTIVE OFFICER, EOS SPACE SYSTEMS

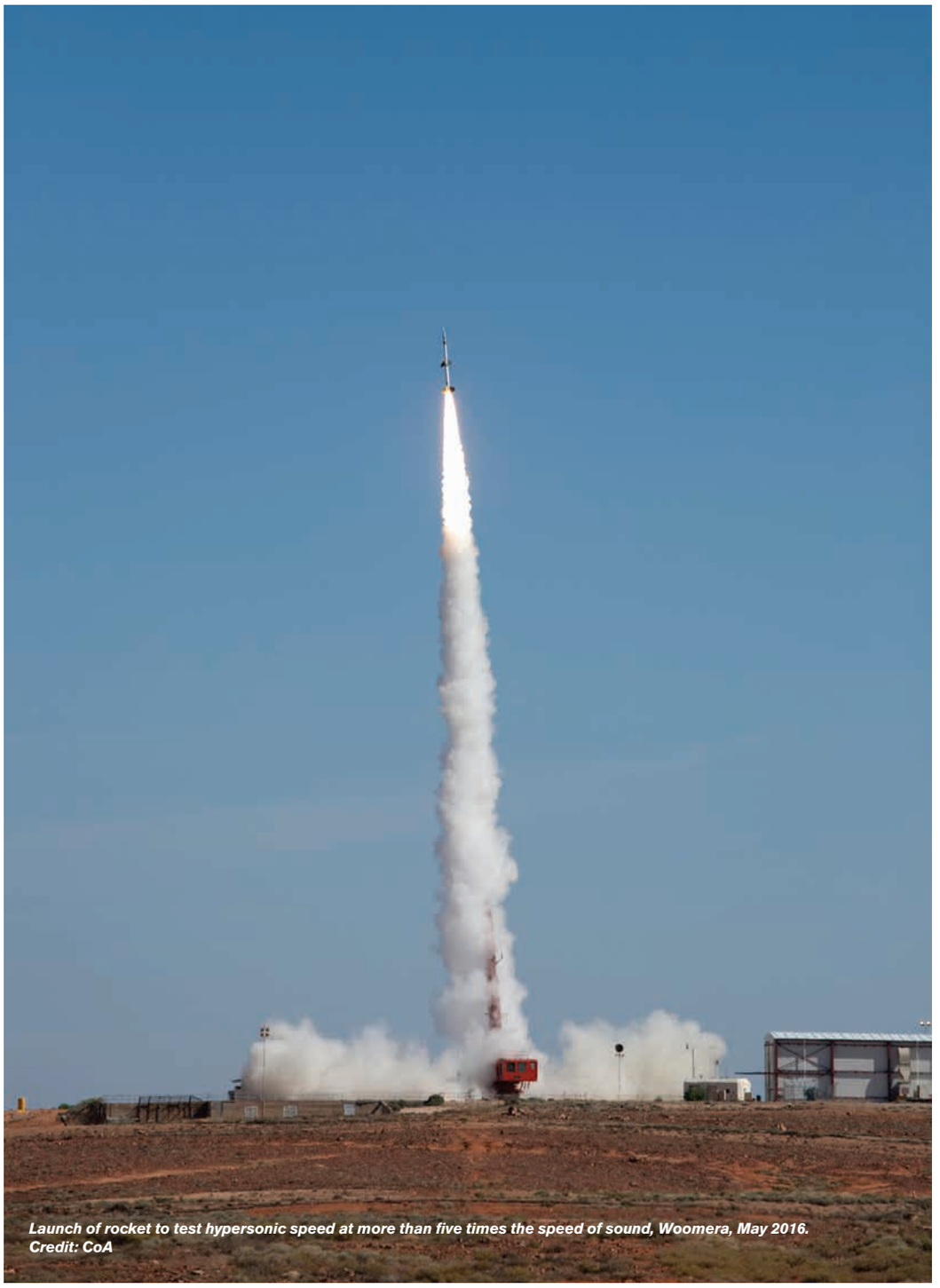
Professor Craig Smith (EOS photo)

Kym Bergmann: Please start with some personal background: how did you come to be involved in EOS and why do you have a particular interest in space?

Professor Craig Smith: I was one of the fortunate (I think) people who knew what they wanted to do from the earliest years. From the age of about 5 I was interested in Space and Astronomy and worked towards a space career throughout my school years. I studied Physics and Astronomy at University, much to my father's dismay. He wanted me to do something practical and useful, with better employment prospects. But I've never been out or a job, so his concerns about the stability of the space industry were largely unfounded, though symptomatic of how Australia has viewed and treated the space industry over the years.

After I completed my PhD, searching for black holes in the centre of our galaxy I worked for 10 years as a research scientist. Most of that time was developing new instrumentation to look at the Universe in different ways. But I came to realise that "real" science with "significant" outcomes isn't done by individuals anymore and Australian Universities aren't really set up to create teams of scientist and engineers to tackle "big" problems. I was a bit different from the pure academic too as I had broader (multi-disciplinary) interests including management and defence related outcomes. So I took a position with EOS to manage their R&D programmes. At EOS I started as Head of R&D, then went to the US to run our US subsidiary company for four years. Back in Australia I had various roles managing our Defence and Space business units, all the while remaining active in technology development.

At EOS I got involved in developing capabilities for the measurement and management of orbital space with a particular focus on space debris. EOS was developing solutions for the Space Debris long before almost anyone knew that it was a problem. We did our first laser ranging tracks of a space debris object in 2002, seven years before the Iridium Cosmos crash that was the moment when the rest of the world realised it had a problem.



Launch of rocket to test hypersonic speed at more than five times the speed of sound, Woomera, May 2016. Credit: CoA

Q: Turning to Australia generally, you have referred to the country having niche capabilities. Please identify those niches. Have they occurred for a reason, or is it all coincidental?

I get really frustrated when I hear people say that Australia is too small an economy to support a Space Industry and niches should suffice. Australia has the same GDP as Russia and they are a space superpower. We have the same GDP as South Korea too, and they are a manufacturing superpower. Its more about the will and lazy reliance on primary industry than the size of our economy or ability. Manufacturing isn't dead. Mindless production line work might be gone, but that is all going to be done by robots anyway in the future. So sending that offshore to low wage countries has only hastened that change, and they have got real problems coming; low wage countries should fear the robots. But there is no reduction in demand for new products and new technologies. So we need to invest in doing the smart stuff that robots (and untrained labour) can't do.

The space industry is a great example of a manufacturing industry where there are relatively few but high value products, where smart people and manufacturing technology are more important than mass production.

Almost every product EOS provides has a laser embedded somewhere. So we use that expertise to tackle problems at the quantum level. Laser tracking, object characterization and counter-space programmes all come from that deep heritage in tech-nology and laser developments.

Australia also has a surprising (and growing) capability for space launch, it has always been strong in downstream data analytics. There are a number of spinoffs from Australian expertise in radio astronomy and low frequency radar. To date, most of the satellite manufacture has resided in Universities building CubeSat's as student projects. Great learning tools and now we have a pool of talent capable of developing satellites with significant capabilities. To keep those people in Australia they need some real satellites to build.

Q: You have mentioned that Australia has certain natural advantages when it comes to the development of space technology. What are they?

For Space Surveillance activities geography and climate play a big part. Australia is in the Southern Hemisphere where there are few SSA sensors and you need Southern Hemisphere data to provide good orbit solutions. It also has access to a range of longitudes in the Eastern Hemisphere that have strategic value. Australia has some of the clearest (low cloud cover) skies on the planet with good longitude and latitude diversity for optical sensors. The only thing we don't have is high moun-tains that would allow us to place sensors above some of the atmosphere. No other single country has that combination.

We also have a highly educated workforce and innovative culture that helps with technology development.

Q: How do you see the role of the Government v the private sector in the future of the industry?

The private sector will do all of the heavy lifting in the Space Sector, but it needs the Government to give it a kick start. We are playing a bit of catch

up and there isn't another country in the world that has a significant space sector where the Gov-ernment hasn't provided the initial impetus. Government departments - federal and state - need to have a little faith in our own Space Industry rather than constantly looking for overseas, off-the-shelf solutions. It also needs to include the Space In-dustry sector in its planning so that Industry can be ready when needs arise.

Q: Do you have a view about how much Government funding is appropriate for the space technology segment? Are there any particular areas that would benefit from Government investment?

The best thing the Australian Government could do to stimulate the space industry rather than individual organisations is to be the "glue" that brings it all together so that we have an end-to-end capability, not just niche technologies.

Q: I'm particularly interested in national security / defence applications. Where do you stand on the issue of whether Australia should have a dedicated military satel-lite for surveillance and / or communications roles? If not a dedicated satellite, are there other investments that could be made that would strengthen the capabilities of Defence?

I am firmly of the view that you bring more value to your allies when you can bring strength and capability to the table, not dependency. I was dismayed that the Australian Government for so long had a formal policy of hanging off the coat tails of the US in space. At least that has largely changed but there is a lot of catching up to do.

I guess we have been allied with the US for so long that it's hard to imagine that not continuing. But we also need to recognise that Australia's and the US strategic policies may not always completely align. So, we need to be able to stand on our own two feet and be able to make our own decisions about what is best for Australia. To do that we need our own, independent capabilities to gather and process the necessary information to feed that decision making process. Having our own assets to do that is a starting point. But we shouldn't confuse data with decisions. We also need the systems and processes to convert the vast amounts of data that are gathered by space assets into something we can interpret to support decision making.

We also need the ability to protect space assets. Australia, with a large land mass and distributed population, is more dependent than most on services provided from space. But those services are largely unprotected. It's becoming a cliché, but space IS becoming more congested and contested. We need to do more to safeguard the services and assets in space whether from accidental collisions with space debris, deliberate attack., jamming, spoofing … Highly capable and expensive systems (aircraft, ships, submarines, even vehicles) can become toothless if denied the infor-mation superiority that we derive from space. A small fraction of what those combat systems cost could and should go towards protecting or crucial space assets that allow those front line warfighting systems to be deployed effectively.

U.S. Wideband Global SATCOM satellite – Australia has bought into the network (USAF cgi)

Q: If the effort were coordinated, does Australia have an industry that could produce an end-to-end satellite programme (launch through to data distribution & inter-pretation)? If not, what do you regard as the missing elements?

Yes it does, but it's not a mature capability. The whole range of activities from satellite development to launch and data processing are available in Australia but distributed over a wide number of companies and organizations. It really needs a programme to bring all these capabilities together. There is that kick start role for Government again. Government doesn't need to fund the space industry (though Government already makes significant outlays for space related products and could spend more of that on local industry) but it could/should make a few strategic investments to get the full range of space activities qualified and recognised internationally as a viable and cost effective capability.

Q: How does Australia stack up internationally in terms of people and companies involved in the domain? Do you believe it is important that countries have sovereign capabilities in certain areas, or is it satisfactory to rely on alliances combined with access to commercially available technologies and data?

Space is a value adding industry where a small but well educated population can make a significant difference. We have some great industry and researchers but as we have discussed, if we want to have an internationally competitive space sector we need to bring them together into teams so we can do "big" science and engi-neering. Individuals and start-ups can't do it alone. Leadership and coordination are required.

From some of my earlier comments it will be clear I believe Australia does need its own independent and sovereign space capabilities, especially in the Defence sector. Our allies will respect us more, our adversaries will fear us more and we get to make our own decisions, rather than being told.