Australian Government

Geoscience Australia

TOPIC: Space and spatial companies

REFERENCE: Question taken on notice – Chair Joyce

Mr Ross: We are working very closely with the RRDCs and a lot of ag tech companies. There are some really interesting ag tech companies out there.

CHAIR: Can you mention some of them?

Mr Ross: Yes. There is CIBO Labs; we're working with them. And DataFarming is another example. I think they might have put a submission into this inquiry. Basically, if you go back 10 years, you had to have a huge chequebook and a huge fleet of satellite experts to use this data. What we're trying to do is take away a lot of that complexity and the capital cost of setting that up so that those who are an SMME, an ag tech company, who are experts in agriculture and working with the industry can pivot into and take advantage of that data.

Mr PERRETT: Sorry—this is going to seem like two questions. And I apologise; I was out. I know we've touched on elements of this, in Mr Sharma's question. You identified the inability to detect interference as a major problem for Australia's use of position, navigation and timing satellite data. What are the main interference threats? And what could Australia do to better detect such interference? Further, you suggest in your submission that Australia develop a suite of small satellites to help address data supply vulnerabilities. Which vulnerabilities do you have in mind?

Dr Woolf: So, two questions?

Mr PERRETT: Yes. But I think we go back to the farming one.

Dr Woolf: Yes.

CHAIR: Take them on notice.

QUESTION DATE: 17 March 2021 (Hansard Page No 9)

QUESTION:
Can GA mention some of the ag tech companies it works very closely with?

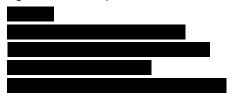**ANSWER:**
Cibo Labs Pty Ltd
Cibo Labs Pty Ltd is an agricultural data analytics company based in Toowoomba and Brisbane Queensland Australia. Cibo Labs uses satellite data, machine learning and other forms of remote sensing to bring new levels of understanding in pasture productivity and land condition to every farm, paddock or field in Australia.

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DataFarming

DataFarming is an Australian precision agriculture company based in Toowoomba, Queensland who deliver leading digital solutions for customers around the world. The company aims unlock the potential of precision agriculture products and farm data by putting easy to use solutions into the hands of every agronomist and producer.

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Astron

Astron is one of Australia's longest established environmental consultancies with over 30 years' continuous experience in Western Australia. Astron uses satellite data and other forms of geospatial information to provide a range of environmental services to clients whose businesses are in mining, energy, infrastructure, land development, government and utilities.

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Zetifi

This is a highly innovative Australian start up based out of Wagga Wagga, their core deliverable is to enable wifi accessibility on farms, however the connectivity they provide also enables our positioning data service, which they use as a demonstrator when explaining how they support Precision Agriculture, Machine Vision, Autonomous Vehicles and more.

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SwarmFarm Robotics

Founded in 2015 near Emerald, Queensland, SwarmFarm Robotics has pioneered the development and use of intelligent robotics in Australian agriculture. The fleet (or Swarms) of sensor-guided autonomous units are already operating in a commercial capacity with early adopter farmers in Australia. The SwarmBot robot is a universal platform that can operate in a wide array of industries. Three applications have been finalised and are ready for commercial use by farming businesses - Spray, Spread and Mow.

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Greensill Farming

Greensill Farming is one of the largest sweet potato farms in Australia, they also grow sugar cane, in the Bundaberg region, they've been using precise positioning technology to help improve the efficiency of their farms.

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Further to these companies we would recommend:

FrontierSI

FrontierSI is a not-for-profit company specialising in spatial information, science and technology. It brings together over 40 organisations who have an interest and understanding in spatial information. FrontierSI delivers capabilities in user engagement, technology development, research and development, and capacity building to Australian government and industry.

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TOPIC: Suite of smallsats

REFERENCE: Question taken on notice – Mr Perrett

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Dr Woolf: So, two questions?

Mr PERRETT: Yes. But I think we go back to the farming one.

Dr Woolf: Yes.

CHAIR: Take them on notice.

QUESTION DATE: 17 March 2021 (Hansard Page No 9)

QUESTION:
You suggest in your submission that Australia develop a suite of small satellites to help address data supply vulnerabilities. Which vulnerabilities do you have in mind? What are the main interference threats?

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ANSWER:

The GA submission proposes Australia develop a suite of small satellites to help address Australia's most critical data supply vulnerabilities. These vulnerabilities (and proposed solutions) include:

- **Dependence of our space applications on satellite imagery that comes from a single foreign supplier**: by enabling users of data to compare and combine images collected by different satellite systems from different countries, allowing them to switch suppliers if needed.
- **Interference with positioning, navigation and timing signals**: by detecting interference, and helping identify targets for possible compliance action by regulators.
- **Space weather conditions that impact satellite operations**: by monitoring the ionosphere and providing the data to space weather forecasters and foreign satellite operators.
- **Lack of satellite imagery tailored to meet Australia's specific priorities and needs**: including data about bushfire fuel loads and inland water quality.

This list is based on our assessment of national priorities. It also considers areas where Australia could also 'give back' to, and burden-share with, the international partners who provide us with much of the data we need. It also takes into account:

- the level of maturity of the local space industry, and areas where this could be matured over time;
- the potential for development of exportable space and satellite technologies;
- the potential to establish a sustainable satellite program (as opposed to targeting expensive and risky 'one off' satellite missions);
- a realistic cost profile with a strong return on investment.

Several of the identified small satellites would use common hardware, thus lowering risk and cost while also creating potential export opportunities for specific satellite sub-systems. Further information is provided below, noting that the space weather mission concept is the least developed at this stage.

Enabling application developers to compare images collected by different satellites, reducing reliance on data from any one foreign supplier by making it easier to switch sources if needed

We do not have the data we need to understand the differences in the satellite images that we receive from different foreign satellite systems. This makes it harder to put data from these different systems together, which in turn encourages the development of space applications that rely on a single system from a single foreign country. We also do not have any way to independently and systematically monitor the quality of the data we get from foreign satellite systems, with the result that our processing systems would be compromised if we were to receive (deliberately or accidentally) poor quality data.

Small 50-100kg Low Earth Orbit 'cross-calibration' satellites would collect a type of data that addresses both of these issues, known as 'hyperspectral' data. We have determined that the development of such missions is feasible for Australian industry. We have also determined that the cost is comparatively low at approximately $36m per satellite, with a minimum of two satellites required initially, and two new satellites launched every two years after that. More information can be found at: https://unsw.adfa.edu.au/space-research/sites/space/files/uploads/GA_ASA_SCR_Public.pdf

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Detecting interference with PNT signals, helping identify targets for possible compliance action by regulators

Australians increasing rely on satellites that deliver Positioning, Navigation and Timing (PNT) capabilities for a growing range of uses that include financial trading, transport automation, road-use charges, law enforcement and corrective services, and personal navigation. Unfortunately with this growing reliance on PNT, the motivation for malevolent people to disrupt these services increases. Moreover, interference can also be accidental and still have significant consequences if it occurs in or around sensitive locations.

Small Low Earth Orbit 'signal detection' satellite would provide the capability able to detect and geolocate ground-based GNSS interference sources and spoofers in the Global Navigation Satellite System (GNSS) frequency bands. This mission is at the early stages of scoping, hence we are not in a position to provide a rough costing.

Acquiring data that is not otherwise available, but that provides an edge to our application developers (such as bushfire fuel loads and inland water quality information)

We are missing two specific types of satellite imagery which other countries are unlikely to fill due to Australia's unique geography: data which maps bushfire fuel in eucalyptus forests and water quality monitoring of small inland water bodies.

Small 75-150kg Low Earth Orbit 'hyperspectral' satellites would collect the type of data that addresses both of these issues. This mission could be built via an expansion of the above 'cross-calibration' satellites and following several successful launches from that satellite series it is likely that this series would be feasible for Australian industry. The cost is likely to be between $75-100m per satellite, following the 'cross-calibration' satellites pattern of launching two satellites every two years. Making meaningful contributions with international partners such as this mission was a key recommendation of the bushfire satellite taskforce, more information can be found at: https://www.industry.gov.au/sites/default/files/2020-12/bushfire-earth-observation-taskforce-report.pdf

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