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# Australia – New Zealand SBAS Demonstrator

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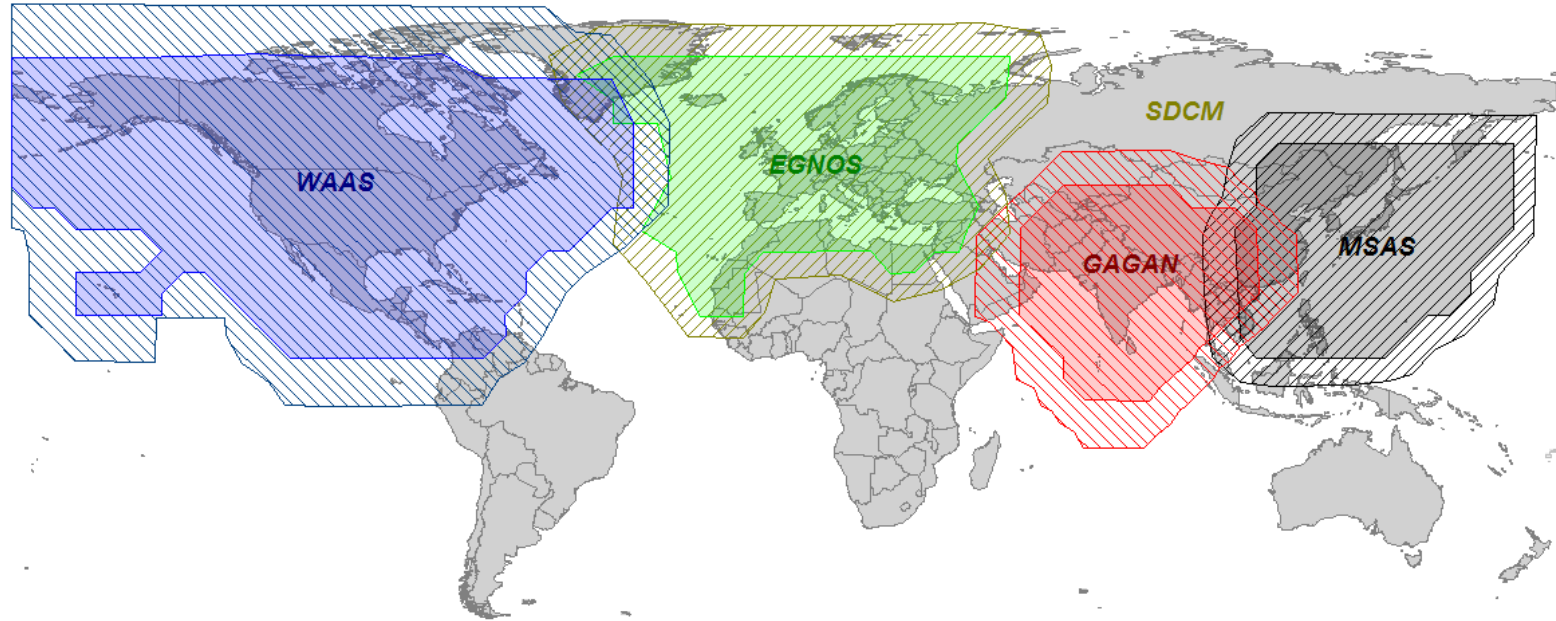
57th Meeting of CGSIC Meeting, Portland OR, 25 September 2017



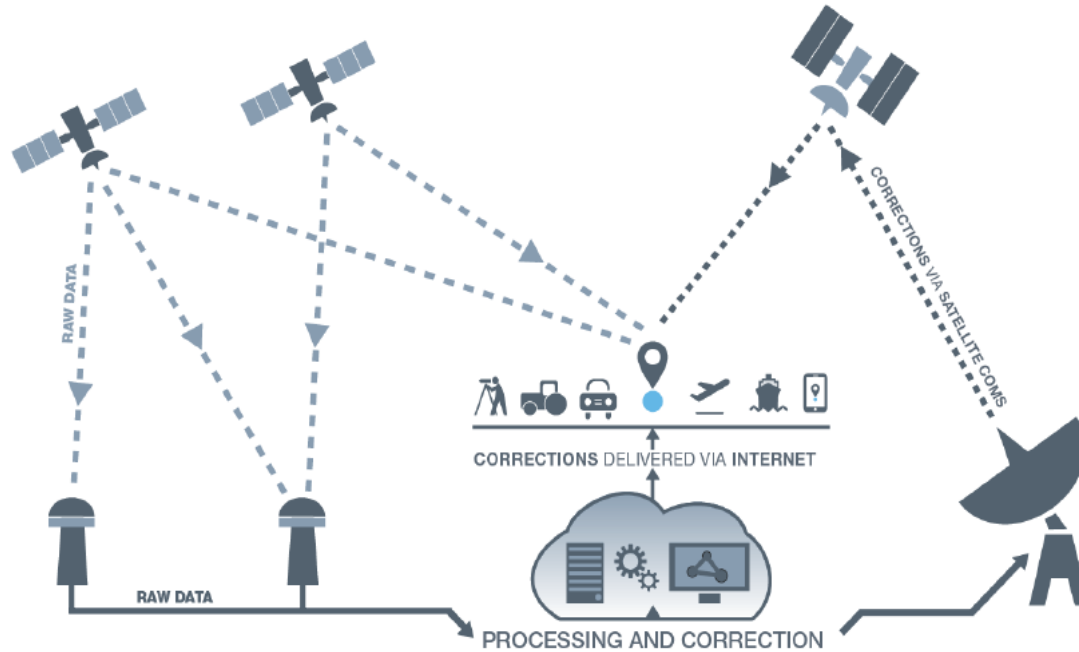
# Context

- Standalone GNSS is not sufficient for existing and emerging safety critical applications
- SBAS improves the accuracy, integrity and availability of basic GNSS
- New Zealand and Australia do not have access to an operational SBAS

# Current SBAS Coverage



# Satellite Based Augmentation



# SBAS – What it provides

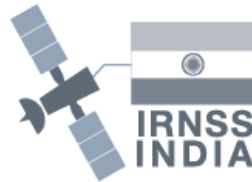


- SBAS improves the accuracy of GPS
  - satellite orbit and clock errors
  - errors due to the Earth's ionosphere
- System integrity information
  - Ability to compute confidence intervals
  - Alert on GPS satellite malfunctions

# SBAS - Testbed

- SBAS = \$\$\$\$
- 2011 Australian Government review:
  - Cost of establishing SBAS in Australia to cover aviation operations at smaller aerodromes not justified
- 2014 New Zealand Government study:
  - The benefits to NZ aviation alone do not out-weigh the cost of developing and operating a SBAS
- Future investment needs to consider all sectors

# Other Opportunities



- Multi-constellation developments
- New civilian frequencies (e.g. L5, E5a)
- Carrier-phase based Precise Point Positioning

# SBAS – Australian Government



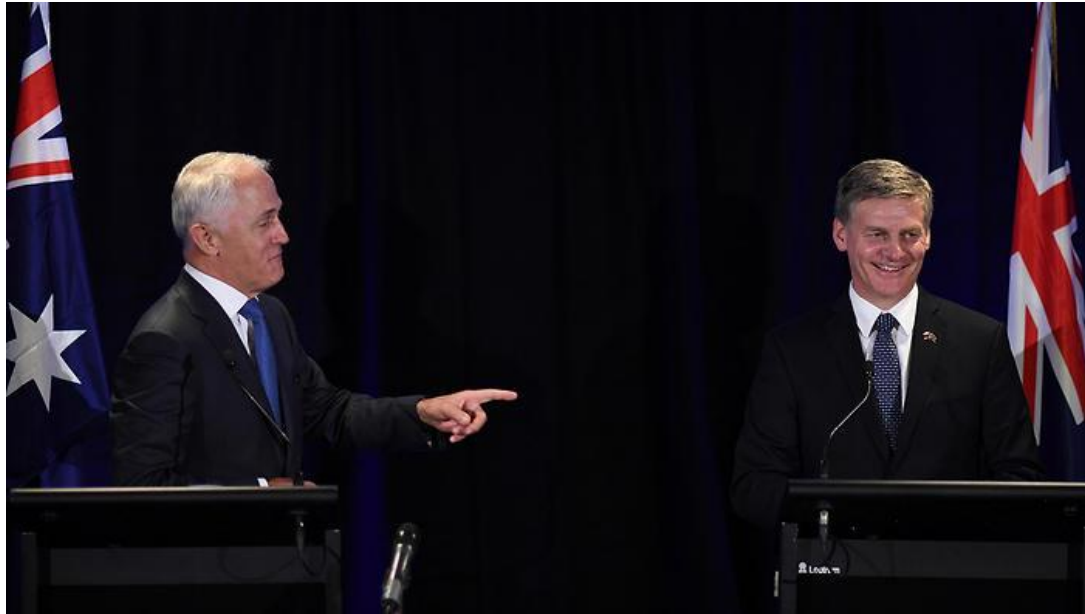
The screenshot shows a web browser window with the URL <http://minister.infrastructure.gov.au/chester/releases/>. The page header includes the name of the Minister, **The Hon Darren Chester MP**, Minister for Infrastructure and Transport, and a navigation menu with links for BIOGRAPHY, MEDIA RELEASES, SPEECHES, INTERVIEWS, OPINION PIECES, PHOTOS, TWEETS, MH370, and CONTACT. A breadcrumb trail reads: [Home](#) > [Chester](#) > [Media Releases](#) > [2017](#) > [January](#) > \$12 million boost for positioning technology in Australia. The main heading is **\$12 million boost for positioning technology in Australia**. A list of bullet points is displayed: 

- **Testing of Satellite Based Augmentation Systems (SBAS) to be undertaken**
- **Future applications for all four major modes of transport in Australia**
- **Potential safety, productivity, efficiency and environmental benefits**

Below the list, a paragraph states: "The Australian Government will invest \$12 million in a two-year program looking into the future of positioning technology in Australia." A second paragraph follows: "From using Google Maps on your smartphone to emergency management and farming, most Australians use and benefit from positioning technology every day without realising it." On the right side of the page, a dark blue box contains the text: **MEDIA RELEASE** DC010/2017, 17 January 2017, and **JOINT RELEASE WITH:** Matthew Canavan, Minister for Resources and Northern Australia.



# NZ Government Participation



“The Prime Ministers welcomed the signature today of the Australia New Zealand Science, Research and Innovation Cooperation Agreement. Agreed to ... test a second-generation Satellite-Based Augmentation System in both countries.”

*Joint Statement by Prime Ministers the Rt Hon Bill English and the Hon Malcolm Turnbull MP, 17 February 2017*

# SBAS Trial Partners



Australian Government  
Geoscience Australia



# Trial Objectives



1. Assess current and future technology
2. Explore current industry positioning requirements
3. Explore industry innovations

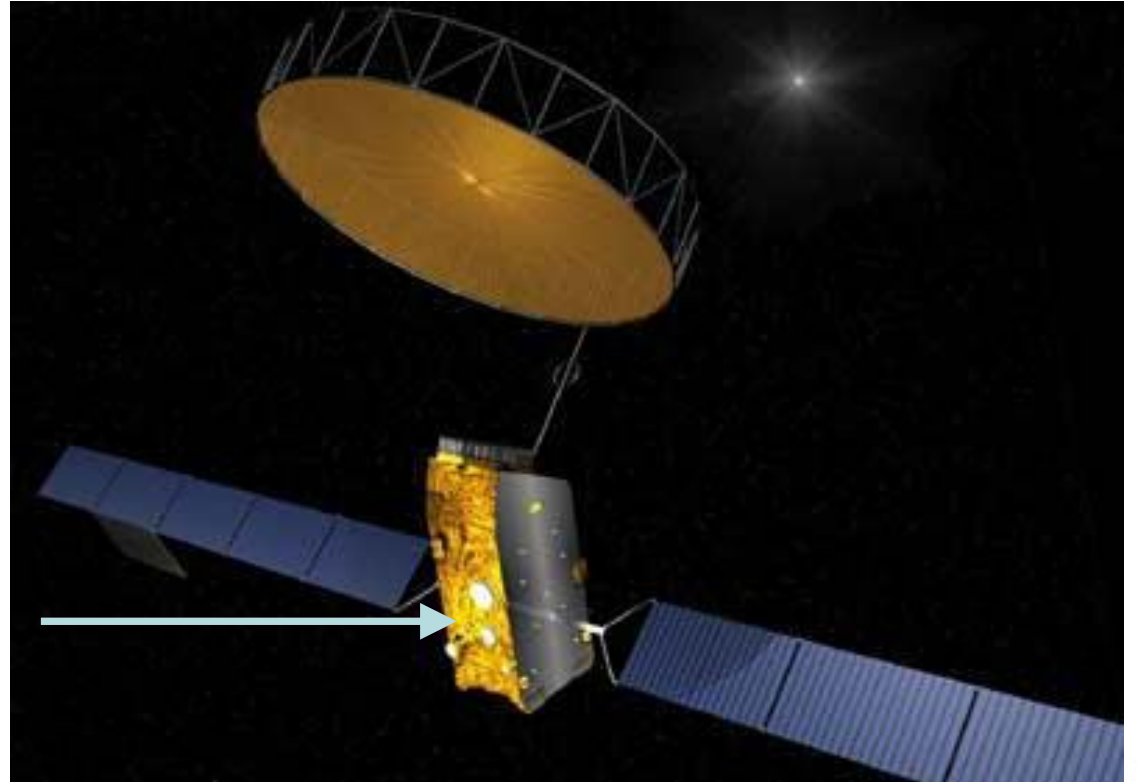
**Ultimately, determine if New Zealand and Australia should pursue the development of an operational SBAS**

# Positioning Services

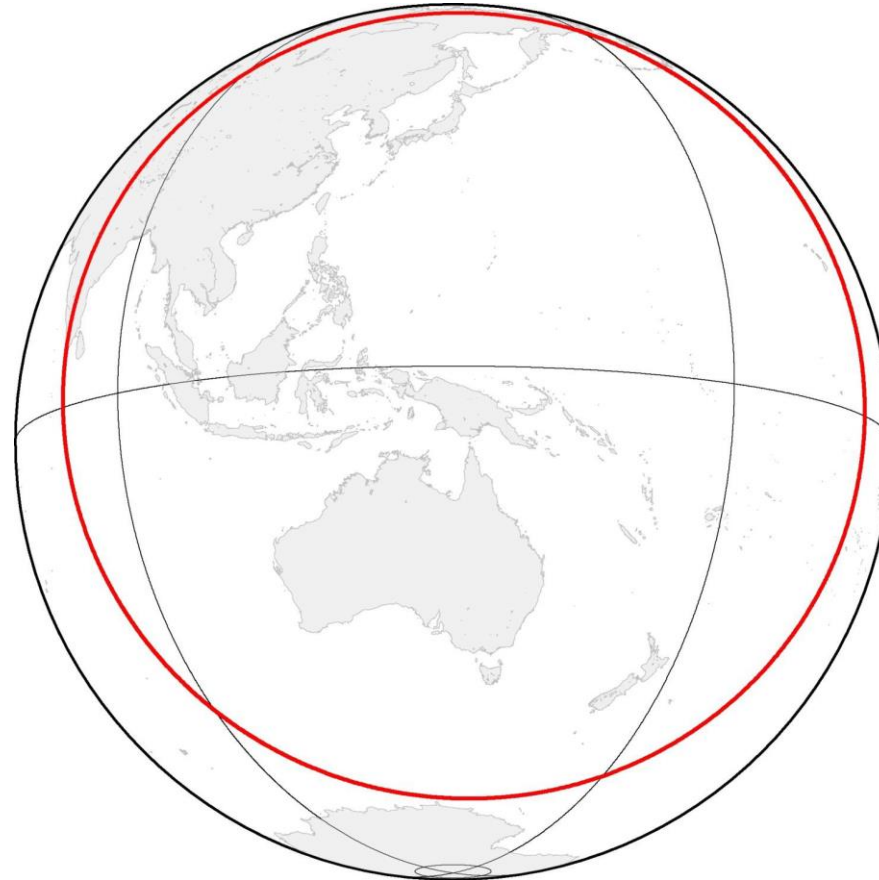
- Current generation SBAS (L1 GPS)
- DFMC SBAS (L1+L5 GPS+Galileo)
- Precise Point Positioning (PPP)
  
- Trials used to identify benefits to economy across all sectors

# SBAS Trial – Inmarsat 4F1 GEO

L Band Transponders



# SBAS Trial – Footprint (15° cut-off)



# SBAS Trial – Uralla Uplink Station

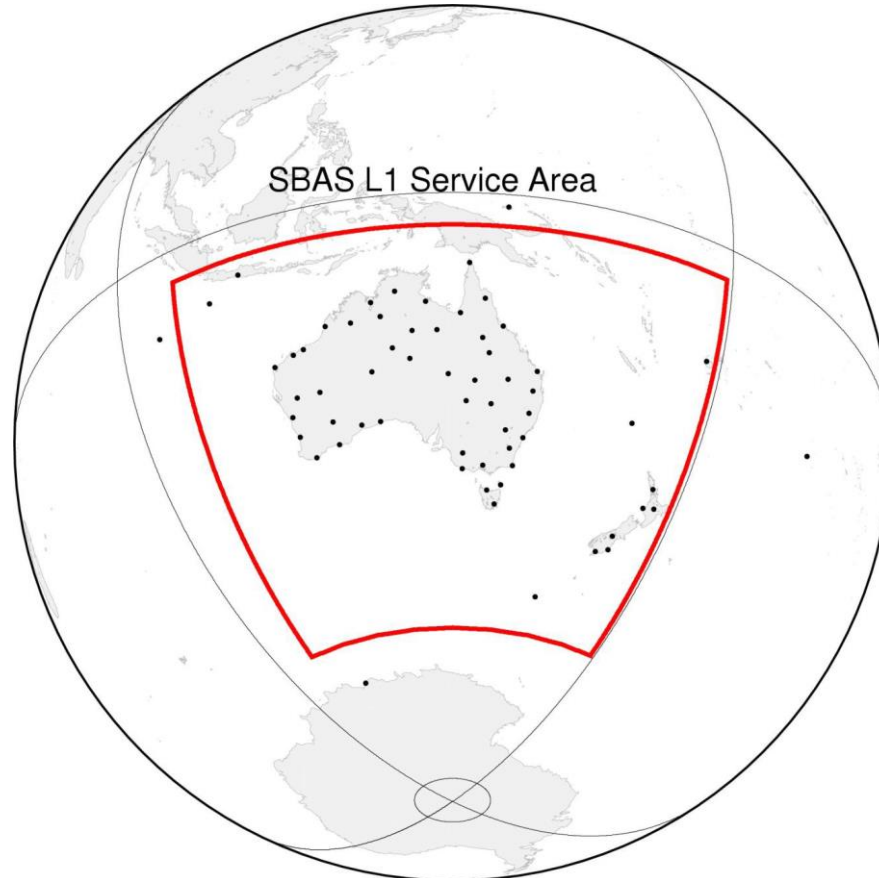


# SBAS Trial – ARGN / AuScope / PositionNZ Networks





# SBAS Trial – Ground Network



# SBAS Trial – Satellite PRN



**DEPARTMENT OF THE AIR FORCE**  
HEADQUARTERS SPACE AND MISSILE SYSTEMS CENTER (AFSPC)  
LOS ANGELES AIR FORCE BASE, CALIFORNIA

1 May 2017

MEMORANDUM FOR GEOSCIENCE AUSTRALIA

- a. Geoscience Australia is authorized to utilize a single L1 C/A and L5 PRN code allocation in the range 120 to 138, for the period of 1 May 2017 through 31 January 2019 for use for SBAS tests, trials, and initial SBAS non-safety of life service. The PRN code 122 assignment, as designated in the table below, will expire on 31 January 2019.

# Trial Programme



- Testing across: agriculture, aviation, construction, maritime, mining, rail, road, spatial, utilities and consumer
- Testing to be coordinated by CRC for Spatial Information

# Maritime

- Close quarters positioning for improved port operations
- Under keel clearance monitoring for improved productivity
- Safer navigation
- Tracking of container movements in intermodal container terminal



# Rail

- Streamlining as-built inspections within the rail corridor



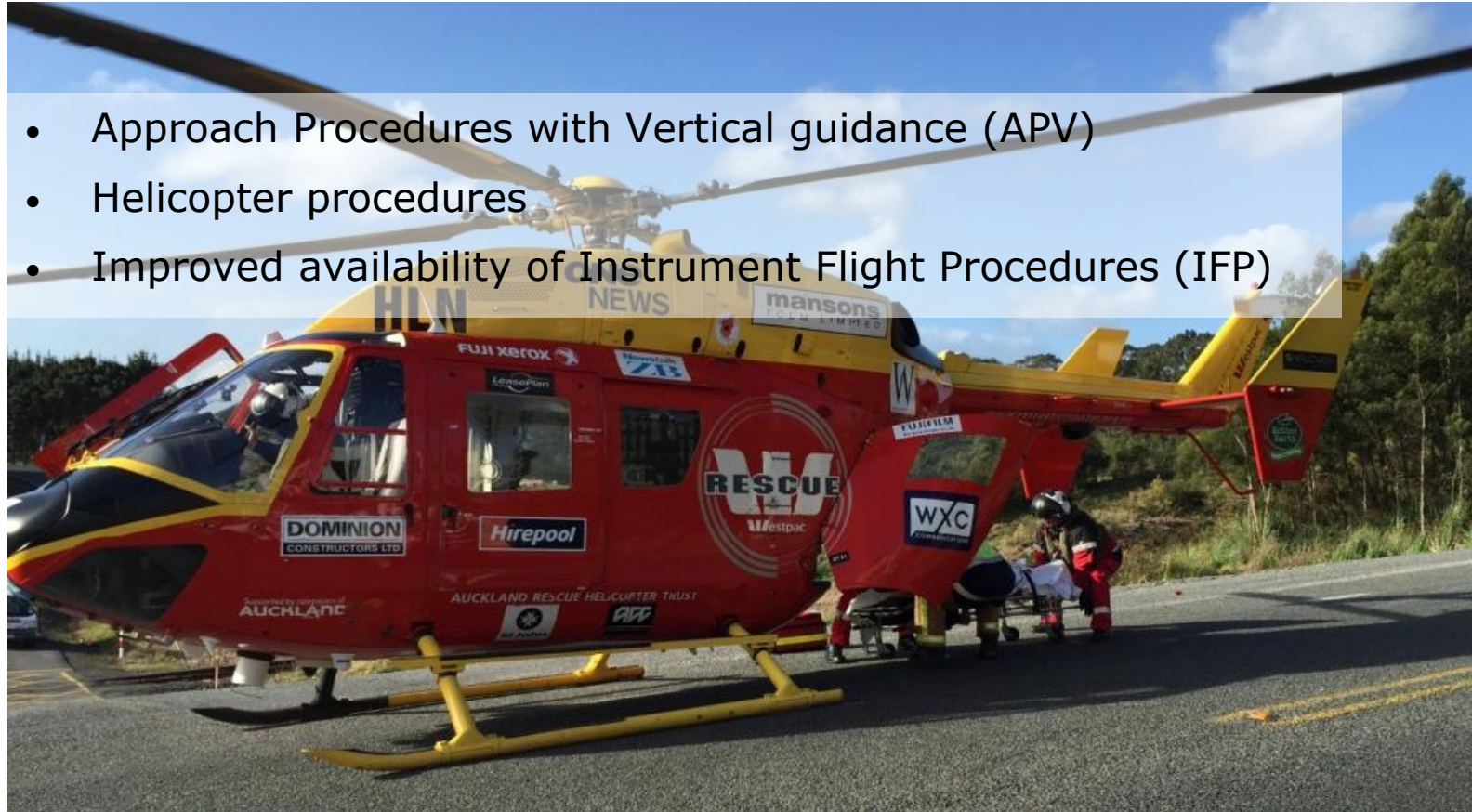
# Road



- Automated driving
  - Trial of a Highly Automated Driving (HAD) vehicle
  - Cooperative Intelligent Transport Systems
- Dedicated Short Range Communications
  - Heavy vehicle field trials
  - 3D digital mapping for automated and CITS
- Vehicle speed determination for regulatory applications
- Real-time road pricing

# Aviation

- Approach Procedures with Vertical guidance (APV)
- Helicopter procedures
- Improved availability of Instrument Flight Procedures (IFP)



# Aviation - UAV

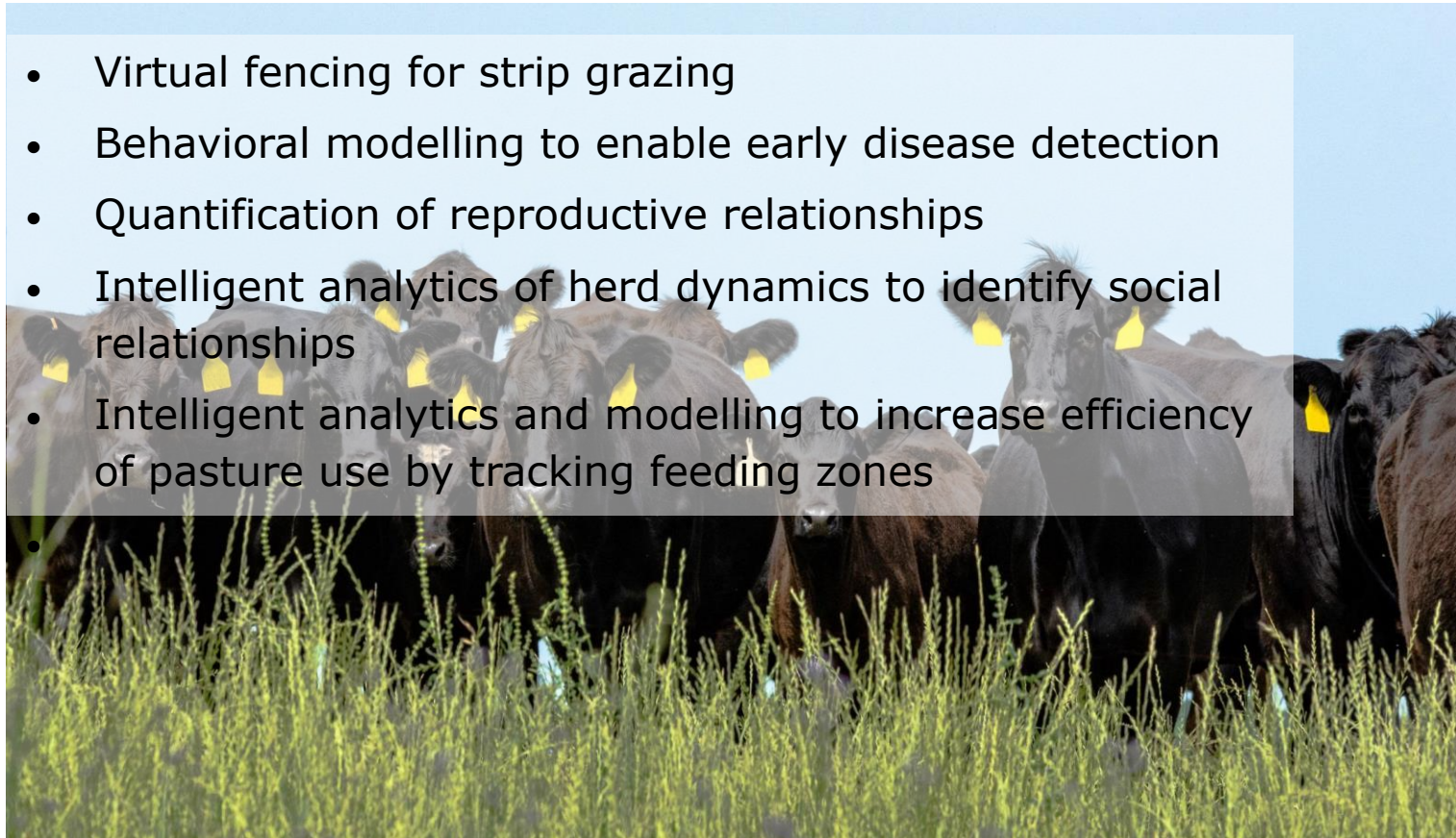
- High-precision drone applications for agriculture and forestry





# Agriculture

- Virtual fencing for strip grazing
- Behavioral modelling to enable early disease detection
- Quantification of reproductive relationships
- Intelligent analytics of herd dynamics to identify social relationships
- Intelligent analytics and modelling to increase efficiency of pasture use by tracking feeding zones



# Agriculture

- Tractor guidance for cropping industries
- Land and forest characteristics mapping

# Construction

- Precision guidance of construction machinery
- Remotely piloted mapping systems for construction industries
- Mapping of underground services



# Resources

- Mine vehicle tracking for fleet management
- Mine operation and control
- Mine safety and environment protection



# High Level SBAS Programme

- Services launched June-October 2017
- Second EOI call open September 2017
- Trials commence October 2017
- Trial service concludes January 2019
- Benefit study report early 2019
- Business case and procurement to follow

# Summary

- New Zealand and Australia do not currently have access to SBAS
- Current and next generation SBAS services being demonstrated
- Trial programme will identify and quantify benefits of services to inform business case for operational Australasian service

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Thank You

