



Boeing Australia Holdings

RESPONSE TO THE ACMA DRAFT FIVE-YEAR SPECTRUM OUTLOOK 2025-2030

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Response to the

Australian Communications and Media Authority's

draft Five-Year Spectrum Outlook 2025-2030

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Boeing Australia Holdings appreciates the opportunity to respond to the Australian Communication and Media Authority's (ACMA) draft Five Year Spectrum Outlook 2025-2030 consultation paper (draft FYSO).

Our response focuses on key radio frequency bands of interest to the Boeing Company's Australian, Asia-Pacific and global operations.

About Boeing Australia Holdings

Boeing has the broadest portfolio in Australian aerospace, with over 4500 employees and an extensive supply chain supporting our advanced manufacturing of commercial aircraft composite components, defence systems design and development, modeling and simulation, research and development, support and training, and uncrewed systems.

Boeing Australia subsidiaries include:

- Boeing Defence Australia is Australia's leading defence aerospace enterprise, supporting some of the largest and most complex programs for the Commonwealth of Australia, the Australian Defence Force, including the Royal Australian Air Force, Australian Army and Royal Australian Navy and commercial customers.
Directly relevant to this submission is, the MQ-28 Ghost Bat developed by Boeing Australia and supported by the Royal Australian Air Force. MQ-28 brings a disruptive advantage to allied forces' crewed and uncrewed missions by delivering affordable mass and rapid capability insertion.
- Boeing Aerostructures is Australia's only manufacturer of high-end aero-structure components, providing customers with a complete solution to aircraft component manufacture – from developing the most aerodynamic and efficient design, to rigorous testing processes.
- Boeing Distribution Australia is a leading solutions provider of aftermarket supply-chain management services for the aerospace, defence and marine industries, serving more than 500 customers in Australia.
- Insitu Pacific – relevant to this submission Insitu Pacific specialises in the design, development, and manufacture of high-performance and low-cost uncrewed aerial systems for commercial and military applications to Australia and the Asia-Pacific region.
- Wisk Aero – relevant to this submission Wisk Aero is a leading advanced air mobility company and developer of the first all-electric, self-flying air taxi bringing the future of flight to Australia.

Our spectrum interests are many including aeronautical, uncrewed systems, defence, space, fixed and mobile satellite services, radiolocation, maritime, 5G, IoT and machine-to-machine applications.

We offer the comments and views in this submission on radio frequency bands and issues discussed in the draft FYSO that are of direct interest to Boeing Australia's operations.

3.3 GHz (3 300-3 400 MHz) - monitoring

The 3.3 GHz frequency band is globally allocated to radiolocation services (RLS) on a primary basis. The mobile service is co-primary with RLS in Region 2 but not listed in Region 1 or 3 as a primary or secondary service, excluding any Radio Regulations (RR) country footnote identifications for IMT/5G. The 2023 ITU World Radiocommunication Conference identified the frequency band for IMT in Region 2.¹ The global identifications for IMT (apart from the Region 2 identification) are complicated and fundamentally authorised via footnotes to the RR Table of Frequency Allocations. The IMT identification RR footnotes specifically note that IMT cannot claim protection from, or cause interference to, RLS allocated in the frequency band, a condition of the identification.

As noted in the ACMA draft FYSO - in Australia ARSP footnote AUS101A applies and stipulates the primary RLS is 'designated to be used principally for the purposes of defence and national security and the Department of Defence is normally consulted in considering non-defence use of this service'. The other allocated services, amateur, fixed and mobile are all secondary to RLS.

Any expansion of IMT/5G into in this frequency band poses significant radio frequency interference potential to Defence global radar operations. In the Defence Department's submission to the 2024 FYSO it noted

'This reallocation will impact a growing number of Defence radar capabilities including non-itinerant systems ... It is also of vital interest to take into account Australia's long term investment into developing globally unique Defence assets before repurposing the 3 300-3 400 MHz frequency band.'

Boeing Defence Australia is committed to providing equipment and services to the Department of Defence for radiolocation operations in this frequency band.

Boeing Australia is of the view there is no solid case for Australia to identify IMT in this frequency range in the foreseeable future. Especially while 3.4-4.0 GHz has recently been repurposed in Australia for IMT/5G/WBB including the auctioning to mobile operators of the frequency bands 3.575-3.7 GHz in 2018 and 3.7-3.8 GHz in 2023.

Boeing Australia proposes:

- Retain the current ACMA position 'monitor' for this frequency band.
- As this is a priority Defence frequency band ensure DoD is consulted on all future considerations.

¹ RR footnote No. **5.429D**

3.4-4 GHz band – implementation

While the frequency band has recently been repurposed for WBB/5G services, Boeing Australia reiterates the importance of mitigation measures to protect the safe operation of aircraft radio altimeters in the nearby frequency range of 4 200-4 400 MHz from high-power 5G base stations operating near aircraft flight paths.

Radio altimeters are essential components of an aircraft for safe operation. The radio altimeter is the only sensor onboard an aircraft providing a direct measurement of aircraft clearance over terrain and other obstacles. Radio altimeters are used during all phases of flight, significantly during precision approaches to landing, determining aircraft proximity to the ground, and in collision avoidance systems. A failure in these sensors can lead to catastrophic results.

Studies conducted internationally have analysed the impact of 5G systems in the frequency range 3 400-4 200 MHz to radio altimeter operations in the adjacent upper frequencies. The studies led to the USA, France, Canada, India, the UK and Japan introducing various mitigation measures to protect radio altimeters from interference from 5G transmissions. Each country has different 5G rollouts and consequently different mitigation measures to protect radio altimeters, i.e. one size does not fit all. For Australia the C band 5G allocated frequency ranges and power levels have potential to cause interference to the operation of group 2 and 3 radio altimeters (predominately used on civil aviation aircraft in Australia).

Boeing Australia's concerns have been previously documented in submissions to the ACMA through the replanning process of these frequency bands including our 'Response to the ACMA's Proposed spectrum re-allocation declaration for the 3.4 GHz and 3.7 GHz bands - consultation paper.'² Boeing Australia commends the ACMA, in conjunction with CASA, in adopting temporary and permanent mitigation measures across the frequency range 3 700-4 200 MHz.

However, similar protection should be properly considered for the frequency range 3 400-3 700 MHz. Studies show 5G base station interference to radio altimeters only marginally reduces at frequencies further from the radio altimeter range of 4 200-4 400 MHz. Australia currently has 5G base stations increasingly operative in the 3 400-3 700 MHz frequency range. Many countries have mitigation measures in place in this frequency range.

Meanwhile, the aviation industry is actively developing new ICAO Standards and Recommended Practices for radio altimeter equipment intended to be more robust than most current devices in rejecting spurious and unwanted emissions from 5G transmissions. This process will take time as technical standards are still under development and will need to be internationally ratified before equipment can be manufactured and eventually installed in aircraft.

In the near term the risk of harmful interference from new 5G/WBB/IMT base stations to radio altimeters is not solely the responsibility of the aviation industry. To avoid unacceptable outcomes from an incident where radio altimeters are negatively affected by 5G transmissions, the mobile service industry and spectrum regulators should cooperate with the aviation industry to support and monitor appropriate interim mitigation measures to prevent interference to aircraft radio altimeters operating in the frequency band 4 200-4 400 MHz.

² ACMA consultation [Draft allocation and technical instruments for the 3.4/3.7 GHz bands auction](#)

Boeing Australia proposes:

- ACMA should work with CASA and aviation industry stakeholders to assess an extension of the current mitigation measures in place for 3 700-4 000 MHz to 5G commercial services in the frequency range 3 400-3 700 MHz consistent with what has happened in other jurisdictions.
- The regulator and telecommunication companies should work cooperatively with the aviation industry on this mutual problem to establish and monitor agreeable and appropriate temporary mitigation measures to protect safe air travel in Australia from potential interference to critical aircraft radio altimeter operations from new and expanding 5G services, especially noting the issues arising from WRC-27 Agenda item 1.7 (discussed below).

4.0 GHz (4 400–4 990 MHz) - monitoring³

Current usage

- The entire frequency band is allocated globally on a co-primary basis to the fixed and mobile services.
- 4 500-4 800 MHz is a primary allocation to fixed-satellite services.
- 4 400-4 800 MHz in Australia is 'principally for the purposes of defence and national security.'⁴
- the entire frequency band in Region 2 and Australia provides aeronautical mobile telemetry for flight testing by aircraft stations.⁵
- in Australia, the frequency band 4 825–4 835 MHz is also allocated to the aeronautical mobile service, limited to aeronautical mobile telemetry for flight testing by aircraft stations.⁶

Regarding the aeronautical mobile telemetry access for flight testing and its relevance to Australia in the two RR footnotes it is essential to commercial and defence aviation that any future planning preserves the integrity and intent of the footnotes.

ACMA has noted in the draft FYSO 'there is some interest domestically from mobile network operators as well as from wireless internet service providers and other fixed wireless access operators in pursuing this band for WBB in Australia.' Boeing Australia agrees with the ACMA further observation that there is no widespread support for use of the frequency band for 5G/WBB applications from regional communication bodies CEPT, CITEL and APT.

³ Noting part of the frequency range is also a consideration of WRC-27 Agenda item 1.7 discussed below.

⁴ ARSP footnote AUS101

⁵ RR footnote No. **5.440A** In Region 2 (except Brazil, Cuba, French overseas departments and communities, Guatemala, Paraguay, Uruguay and Venezuela), and in Australia, the band 4 400-4 940 MHz may be used for aeronautical mobile telemetry for flight testing by aircraft stations (see No. **1.83**). Such use shall be in accordance with Resolution **416 (WRC-07)** and shall not cause harmful interference to, nor claim protection from, the fixed-satellite and fixed services. Any such use does not preclude the use of this band by other mobile service applications or by other services to which this band is allocated on a co-primary basis and does not establish priority in the Radio Regulations. (WRC-07)

⁶ RR No. **5.442** In the frequency bands 4 825-4 835 MHz and 4 950-4 990 MHz, the allocation to the mobile service is restricted to the mobile, except aeronautical mobile, service. In Region 2 (except Brazil, Cuba, Guatemala, Mexico, Paraguay, Uruguay and Venezuela), and in Australia, the frequency band 4 825-4 835 MHz is also allocated to the aeronautical mobile service, limited to aeronautical mobile telemetry for flight testing by aircraft stations. Such use shall be in accordance with Resolution **416 (WRC-07)** and shall not cause harmful interference to the fixed service. (WRC-15)

Aviation safety considerations

Boeing Australia opposes 5G/IMT/WBB in this frequency band given its proximity to the aviation radio altimeter safety of life allocation at 4 200-4 400 MHz. This mirrors the same problem described above for the 3 400-4 200 MHz frequency range.

Radio altimeters are an essential component of a commercial and military aircraft enabling precision approach, landing, ground proximity and collision avoidance functions to work faultlessly. Studies have identified potentially serious interference to radio altimeter systems from the operation of 5G macro base stations near the frequency band. Until this matter is resolved, it is in the critical interest of air travel safety this frequency band not be considered for identification of IMT/5G/6G.

Defence operational considerations

In previous FYSO's the Department of Defence noted in relation to frequency bands 4 400-4 500 MHz and 4 800-4 990 MHz Defence platforms could be directly affected due to possible radio frequency interference by the IMT in these frequency bands. The frequency bands are part of the harmonised Five Eyes and NATO spectrum used extensively by defence. Such use is incompatible with 5G/IMT applications in the same frequency range.

Boeing Australia and subsidiaries have defence contracts in place and are reliant on this frequency band remaining 'principally for the purpose of Defence.'

Boeing Australia is opposed to identification of 5G/IMT in Australia in this frequency range and proposes:

- The 4 400-4 500 MHz and 4 800-4 990 MHz frequency bands should be removed from monitoring as they are part of the harmonised Five Eyes and NATO spectrum used by Defence for aeronautical mobile services, data transfer, command, control and telemetry as well as for Navy fleet wide communications in Australian territory.
- Communication operational infrastructure to support these services is provided by Boeing Australia and many other Australian defence industry contractors.
- Sharing of the applications and services in this frequency band is not feasible.
- Exceptionally noting the public importance of protection of safety of life aeronautical radio altimeter operations in the adjacent 4 200-4 400 MHz frequency band from IMT/5G/WBB base stations. Introduction of these high-power base station operations is incompatible with ARNS allocations and any IMT/5G identifications should be opposed.
- ACMA to ensure the spectrum regulatory protection of the current arrangements in the frequency band in the interest of defence and national security use.
- Ensuring the retention of RR footnotes No. **5.440A** and **5.442**, and
- the need to retain access to part of the frequency range allocated via footnotes to the RR Table of Frequency Allocations to aeronautical mobile telemetry for flight testing by aircraft stations.

5 030–5 091 MHz RPAS - monitoring

At WRC-12, the 5 030–5 091 MHz frequency band was identified in the Radio Regulations for use by line-of-sight (LoS) and beyond line-of-sight (BLoS) remotely piloted aircraft systems (RPAS) control and non-payload communication (CNPC) links. It is only recently that spectrum regulators, notably ACMA, FCC, MIC (Vietnam) and KCC have moved to free up access to this frequency band to accommodate RPAS communications.

RPAS operating in non-controlled airspace predominately use the low interference potential device (LIPD) class licence for both CNPC and payload communications.

While LIPD access is useful for smaller RPAS and hobbyists' drones, the inherent low power constraints and congestion of the LIPD radio frequencies are not suitable for medium to large RPAS running business and security operations at times in environments that require reliable safety-critical control links. The LIPD constraints have been acknowledged by ACMA in a positive response where arrangements were put in place in 2022 to facilitate temporary access to part of the frequency band (i.e. 5 055–5 065 MHz) for LoS RPAS CNPC links. ACMA states these interim arrangements will be in place until international arrangements are sufficiently mature including progress of a draft new ITU-R Recommendation that specifies terrestrial air-ground links characteristics operating in the aeronautical mobile radiocommunication service in the band.⁷ ACMA then proposes to release an 'options paper outlining proposals for more permanent arrangements.' This assumes widening access to the entire frequency range.

The frequency band needs to be protected for future requirements for UAS and in the event that demand exceeds the current 10 MHz interim access ACMA should move expeditiously to free up more of the frequency band.

Boeing Australia acknowledges and agrees that ACMA is only responsible for the spectrum aspects of RPAS regulation in Australia whereas air safety and operational regulatory provisions are the mandate of the Civil Aviation and Safety Authority and Airservices Australia, and any arrangements in the frequency band are to be developed in consultation with those agencies and ICAO standards and practices.

Recognising the frequency band 5 030-5 091 MHz only provides a small amount of internationally harmonised spectrum for RPAS CNPC, there is a pressing need for more spectrum to be available, for both CNPC and payload applications for medium to large RPAS, this is discussed below under 'Emerging aviation technologies and spectrum regulation'.

Presently there is no commercially available satellite access for UAS payload operations in 5 030-5 091 MHz to support the aeronautical mobile-satellite (R) service. Given the rapid developments across the satellite industry especially non-GSO constellations it is possible a viable service could become available especially if supported by open access to the frequency band for RPAS. For Australia's vast airspace this is perhaps a prime option for countrywide and intercontinental UAS operations. Rather than seeing regulation follow technological developments Boeing Australia encourages ACMA to take a lead in drafting spectrum regulations that can support future BLoS radiocommunications for UAS.

⁷ [Preliminary draft new Recommendation ITU-R M.\[AM\(R\)S AMS\(R\)S CHAR 5GHz\]](#) - Characteristics and protection criteria of terrestrial and satellite unmanned aircraft system control and non-payload communications links operating in the aeronautical mobile (route) service and aeronautical mobile satellite (R) service in the band 5 030-5 091 MHz

Boeing Australia commends the ACMA for introducing arrangements for interim access to the frequency band for RPAS CNPC. However, there has been no apparent regulatory progress for some years from ACMA or government to further this access. While the ITU-R studies are continuing, countries including Australia have separately taken regulatory initiative to progress access to this vital aeronautical spectrum.

Boeing Australia proposes the ACMA:

- While there is value in supporting the existing ITU-R studies to develop international radiocommunication regulations for both terrestrial and satellite RPAS communications in this frequency band it does not preclude regulators taking independent initiatives to free up this access, and
- consider and facilitate access as soon as possible to the entire 5 030-5 091 MHz frequency range dependent on developing user demand that additional could stimulate commercial satellite communication support.

40 GHz (37–43.5 GHz) 46 GHz (45.5–47 GHz) 47 GHz (47.2–50.2 GHz) and 50 GHz (50.4–51.4 GHz)- monitoring

Across these frequency ranges there are primary allocations in the RRs for a range of services including space research, fixed, mobile, mobile satellite and fixed satellite services in Australia.

The frequency bands are subject of WRC-27 agenda item 1.6 for equitable access of the frequency band for FSS.⁸

ARSP footnote AUS101, determines the 37-37.5 GHz band is designated to be used principally for defence and national security.⁹

ACMA, which has not included 50.4-51.4 GHz in its FYSO monitoring, notes 'The 40 GHz and 47 GHz bands are of significant interest for both terrestrial 5G and satellite broadband services.'

Boeing Australia notes, in Australia, there are currently no formal spectrum regulatory arrangements for any services in the frequency bands > 46 GHz.

WRC-27 Agenda item 1.1 is considering technical and operational conditions for the use of the frequency bands 47.2-50.2 GHz and 50.4-51.4 GHz (Earth-to-space), or parts thereof, by A-ESIM and M-ESIM communicating with GSO and non-GSO space stations in the fixed-satellite service.

IMT interest in the frequency bands

- The 40 GHz band was identified globally for IMT.
- In 2019, the US auctioned licences in the 37.6–38.6 GHz, 38.6–40 GHz and 47.2–48.2 GHz frequency ranges for 5G.

⁸ WRC-27 Agenda item 1.6 'to consider technical and regulatory measures for fixed-satellite service satellite networks/systems in the frequency bands 37.5-42.5 GHz (space-to-Earth), 42.5-43.5 GHz (Earth-to-space), 47.2-50.2 GHz (Earth-to-space) and 50.4-51.4 GHz (Earth-to-space) for equitable access to these frequency bands, in accordance with Resolution **131 (WRC-23)**'

⁹ AUS101 'This band is designated to be used principally for the purposes of defence and national security. The Department of Defence is normally consulted in considering non-defence use of this band.'

- In 2022, the ECC published a decision on harmonised technical conditions for mobile/fixed communications networks (MFCN) in the band 40.5–43.5 GHz frequency band.
- Canada plans to make the 38 GHz frequency band available for 5G mmWave and is currently consulting on auction conditions for later this year.
- Ofcom has confirmed auction of the 40.5-43.5 GHz frequency band this year.¹⁰

The frequency band 37-43.5 GHz is identified globally for IMT/5G via RR footnote No. **5.550B**. The footnote indicates various FSS allocations that need to be protected from IMT transmissions.

A report by Plum Consulting in 2023 showed ‘only 35 countries in our analysis have assigned spectrum above 7 GHz [for IMT], and there is a wide variety of types of assignment. There are several assignments in the 26 GHz band, particularly in Regions 1 and 3, and a few assignments in the 28 GHz band, such as in Japan, Singapore, Taiwan, and the US.’¹¹

The Republic of Korea Ministry of Science and IT revoked mmWave licences in their country as operators did not utilise their access to the frequency bands.¹²

With 5G/IMT/WBB mmWave spectrum available in Australia in the frequency ranges 25.1-27.5 GHz and 27-29.5 GHz, there is no pressing need to consider these frequency bands for more 5G/IMT mmWave spectrum. The Australian Mobile Telecommunications Association in their 2024 FYSO submission said ‘the 40 GHz band is not a short-term priority for industry, and agree that no further work needs to be carried out in the 2024-25 work program.’

Fixed-satellite service interest in the frequency bands

The traditional satellite frequency bands such as C, Ku and Ka are not only congested but have been partially reallocated, often to IMT/5G. Satellite data traffic would benefit from using mmWave frequency bands that have not yet been widely exploited.

The mmWave frequency bands gives satellite operators access to high-quality, ultra-fast, reliable communications channels. mmWave frequencies are ideally suited for feeder links, enabling high-speed data exchange between satellites and ground stations, as well as for relaying data between satellites within constellations.

FSS operators in the past have argued to progress this to ‘initial planning’ given the roll out of new satellite applications and green field opportunities of Q and V band radio frequencies.

Across most of these frequency bands Australia does not have any allocations.

Intelsat in their 2024 submission to FYSO noted

‘advances in satellite manufacturing and earth station technology have made ESIM more widespread and more practical.... the utilization of Ku- and Ka-band frequency spectrum for ESIM connectivity is growing exponentially to meet user demands, which may lead to scarcity in spectral resources in these bands. The passengers’ ever-increasing hunger for bandwidth, combined with immense potential to obtain utmost operational proficiency with IFC use will lead to steep increase in the required capacity.’

¹⁰ Ofcom 20 March 2025 [Enabling mmWave spectrum for new uses](#)

¹¹ [Examining the current assignment and usage of mobile spectrum](#) - July 2023 Plum Consulting

¹² [Korean govt falls for 5G fallacy over 28GHz | Light Reading](#)

Boeing Australia proposes the ACMA:

- Consider progressing the planning stage to 'initial investigation' in light of satellite applications being developed and the ACMA intention to undertake 'a comprehensive review' thereby providing additional planning certainty for future services. Considering there are currently no compatibility issues with other services there is great potential to maximise the utility of this spectrum which may provide opportunity to share with IMT.
- Support the ITU-R studies for WRC-27 agenda item 1.1 to harmonise parts of the frequency band for ESIM on aircraft and vessels with GSO and non-GSO space stations of the FSS, and
- support the existing allocation of primary services specifically retaining and protecting the utility of the FSS primary allocation in the frequency band.

Bands being studied under WRC-27 Agenda item 1.7

WRC-27 Agenda item 1.7 undertaking sharing and compatibility studies and technical conditions for the possible use of IMT in the frequency bands 4 400-4 800 MHz, 7 125-8 400 MHz (or parts thereof), and 14.8-15.35 GHz.¹³

These frequency bands, either in part or in full, are used for defence purposes in Australia.

The 4 400-4 800 MHz frequency band

This frequency band is immediately adjacent to the primary safety of life aeronautical radionavigation service (ARNS) frequency band of 4 200-4 400 MHz reserved exclusively for radio altimeters installed onboard aircraft. The radio altimeter is a mandatory safety-critical aircraft system.

This frequency range was studied for IMT compatibility at WRC-15 under Agenda item 1.1. The outcome of those studies was overwhelming consensus that services allocated in the frequency band were not compatible with ubiquitous IMT deployment. This is particularly relevant to IMT/ FSS compatibility. However, the studies did not include compatibility of IMT with radio altimeters in the adjacent frequency range 4 200-4 400 MHz. The issue of radio altimeter incompatibility came about after WRC-15 when in 2018 3GPP specifications of the n78 frequency range (3 300-4 200 MHz) were approved and released. After the standards were released aviation industry undertook studies showing serious incompatibility of 5G base stations transmissions with radio altimeters in the adjacent frequency range.¹⁴

Below the ARNS frequency band Australia has introduced permanent and temporary mitigation measures to prevent operation across the frequency range 3 700-4 200 MHz of ubiquitous 5G base stations interfering with the safe operation of aircraft radio altimeters.

The same radio altimeter interference issues exist above the ARNS frequency band and this proposal includes no buffer zone ('guard band') similar to that in the Australian provisions for 3 700-4 200 MHz.

¹³ Most of the agenda item bands are Region specific - 4 400-4 800 MHz, in Region 1 and Region 3; 7 125-8 400 MHz in Region 2 and Region 3; 7 125-7 250 MHz and 7 750-8 400 MHz in Region 1; and 14.8-15.35 GHz globally.

¹⁴ See RTCA paper [Assessment of C-Band Mobile Telecommunications Interference Impact on Low Range Radar Altimeter Operations](#), and Airline Pilots Association, Int'l [Aircraft Operations and Radar Altimeter Interference from 5G](#)

In domestic preparatory work for WRC-23 the Australian Mobile Telecommunications Association stated regarding this frequency band ... 'we're not suggesting that Australia should support this band.'

Defence in their 2024 FYSO submission noted 'this frequency band will not be identified in Region 2 (North and South America) and majority of European nations (i.e. NATO member countries) and United Kingdom expressed strong opposition to the inclusion of this band in Region 1 at WRC-23.' Thereby denying any valuable global economies of scale and geographical ubiquity for IMT services.

This frequency band is a harmonised NATO band type 1 that's is specifically designated for use by NATO forces and its Member states in a coordinated manner. This harmonisation ensures efficient frequency utilisation and provides military users with greater access to the radio spectrum. While Australia is not a member of NATO we do 'share a deep relationship based on addressing shared security challenges that affect both the Euro-Atlantic and Indo-Pacific regions' according to DFAT.¹⁵ The scope of cooperation between Australia and NATO includes 'upholding the rules-based international order, promoting mutual understanding of global security issues, enhancing interoperability between NATO and Australia, and engaging on issues of common interest, including cyber defence; countering hybrid threats; resilience; Women, Peace and Security; and new technologies', much of which is underpinned by secure radiocommunication facilities.¹⁶

The 7 125-8 400 MHz

The X and Ku bands satellite are major defence and NATO frequency bands. Specifically 7 250-8 400 MHz is a core Defence satellite communications band with worldwide operational footprint and significant harmonisation interests making it entirely unsuitable for IMT identification that would technically and operationally compromise operations.

Other services allocated to the frequency band have been shown to be incompatible to IMT, that is Earth exploration satellite service, fixed satellite service, metrological-satellite service (MetSat) and space research service.

14.8-15.35 GHz frequency bands

Adjacent to 14.8-15.35 GHz is the frequency band 15.4-15.7 GHz that is allocated to the primary aeronautical radionavigation service and used for ground-based primary surveillance radar systems including precision approach radar (PAR) and airport surface detection equipment (ASDE).

These functions are critical to maintaining public and aircraft safety and will be adversely affected by IMT operations in the adjacent frequency band.

The 15.4-15.7 GHz frequency band is also identified by ICAO for use by the following systems, that may be impacted by IMT out-of-band emissions:

- On-board weather radar - a safety-critical instrument assisting pilots in deviating from potentially hazardous weather conditions and detecting wind shear and microbursts. It supports the safe passage of an aircraft in the vicinity of turbulent weather conditions and

¹⁵ Australian Embassy - Belgium, Luxembourg and Mission to the European Union and NATO – Relations with NATO <https://belgium.embassy.gov.au/bsls/relnato.html>

¹⁶ NATO – Relations with Australia October 2024 https://www.nato.int/cps/en/natohq/topics_48899.htm

provides timely warnings of rapidly changing weather conditions as an aid to in-flight route planning.

- Ground mapping radar – that support maintaining contact with geographic features, such as shorelines, as a supplement to navigational orientation.
- Detect and Avoid (DAA) systems - a critical component of remotely piloted aircraft system (RPAS). It contributes to mitigate the risk of separation loss and prevent collision with the ground and other aircraft. DAA equipment can either be located on-board aircraft or on the ground.

Background to the WRC-27 Agenda item

This agenda item was arrived at in closed discussions at the dying stages of WRC-23. Australia and the Asia-Pacific Region (Region 3) were not involved in these discussions. The potential negative consequence for aviation, defence and other radiocommunication services from outcomes that may identify IMT/5G/6G in these frequency ranges is considerable.

In the past, Australia has often been a significant influencer in international radiocommunication fora and needs to regain that reputation. As Region representation is paramount to deciding high risk intractable matters at WRCs, Australia needs to invest considerable effort and expertise into managing the APT preparatory process for the World Radiocommunication Conference to bolster regional outcomes at the coming WRC and influence agenda items for future conferences to Australia's ultimate advantage.

An Australian position on WRC-27 agenda item 1.7

While ACMA proposes the way forward in this draft FYSO to 'continue to engage with stakeholders via the [DITRDCA](#) and [ACMA's](#) preparatory processes for international meetings to develop Australian positions on WRC27 agenda item 1.7 and contribute to studies. Developments in other regions and countries will also be monitored.' Boeing Australia cautions that this is not sufficient.

Further noting, at the time of writing DITRDCA, responsible for developing Australian Government positions on WRC agenda items, had not started that process. A process well underway by all other significant WRC engaged administrations. While DITRDCA's responsibility, ACMA is the key adviser on spectrum matters to the Department and could have significant influence to motivate the Department to action.

The frequency bands are wholly unsuited for IMT in Australia and this should now be established as the Australian position as discussions in a preparatory process will be lengthy and time consuming while inevitably concluding the same outcome.

It would be beneficial to all Australian radiocommunication stakeholders to identify the position that IMT is not suitable in these frequency ranges and accordingly participate in ITU-R studies to this effect. This will provide planning certainty for stakeholders and redirect efforts to explore spectrum planning options in other radio frequency bands more suited to viable outcomes for IMT.

Boeing Australia proposes:

- The ACMA and Australia urgently position this issue as 'no IMT identifications' in any of the frequency bands in Australia, and
- engage in ITU studies to protect the use of the frequency bands used for Defence purposes and aeronautical safety of operation in Australia.

Emerging aviation technologies spectrum regulation

For consistency in this section reference to uncrewed aircraft systems (UAS) generally includes RPAS and drones of medium to larger size aircraft for commercial, government and defence use.

The UAS industry continues to grow exponentially, with Australia often at the forefront. While aviation standards and technology developments that accompany UAS operations are the responsibility of other regulators, intergovernmental agencies and industry bodies, access to, and regulation of, spectrum in Australia is the responsibility of the ACMA.

As noted by the ACMA,

‘most current drone use-cases can be supported by the [LIPD class licence](#), and users can access the spectrum the class licence makes available at no cost ... While we expect drones to transfer more and more to mobile (including 5G) networks over time, larger drones used for commercial or military purposes are increasingly requiring access to dedicated aeronautical spectrum such as the 5030–5091 MHz band.’

Boeing Australia welcomes creative and world leading initiatives by the ACMA in spectrum access for the medium/large commercial and defence UAS industries. Notably arrangements for temporary access to a portion of the 5 030-5 091 MHz frequency band is a significant step forward. Nonetheless, aviation requires more formally identified spectrum for medium to large UAS operations than available across LIPD class license and the small amount of spectrum provided in the 5 030-5 091 MHz ARNS allocation.

Boeing Australia agrees and welcomes access to 5G infrastructure that can facilitate multiple payload communications. However, the safety of life CNPC aspects will not be adequately supported by access to the public mobile telecommunications system. Constraints include the more demanding medium/large UAS requirements for flight coverage that may travel beyond mobile network range and issues of high reliability QoS for CNPC requirements. Safety critical CNPC requires dedicated spectrum.

Under ‘Activities planned for 2025-26’ in the draft FYSO, ACMA references a number of monitoring tasks, yet no actual programs or initiatives to drive spectrum regulation for UAS with the relevant agencies, especially CASA and Airservices Australia. ACMA has shown in the past that it can be a world leader in this field and Boeing Australia encourages ACMA to maintain progress for viable and accessible spectrum regulation supporting new larger and safety critical UAS operations in Australia.

‘Monitoring’ sentiments do not align with a more proactive Australian Government drone spectrum policy and does not build on the positive approach to drone spectrum management from three years ago.¹⁷ Advanced Air Mobility (AAM) and RPAS innovation is strongly supported by industry and government in Australia and ACMA must continue to look for new opportunities to free up spectrum access for medium to large UAS CNPC communications noting recent developments in CASA and industry group AAUS.¹⁸ It is noted in the CASA RPAS and AAM Strategic Regulatory Roadmap 2024 that CASA ‘needs to understand spectrum usage requirements for RPAS and AAM and works with the Australian Communications and Media Authority (ACMA) and across government to support meeting spectrum

¹⁷ <https://www.drones.gov.au/policies-and-programs/policies/spectrum-policy>

¹⁸ For examples see a) CASA [The RPAS and AAM Strategic Regulatory Roadmap](#) and b) [AAUS Release Vision Roadmap for AAM](#)

needs.’ This appears to place some onus on ACMA to assist CASA in its understanding of the spectrum requirements.

Boeing Australia supports ACMA collaboration with CASA, the Department of Infrastructure, Transport Regional Development, Communications and the Arts, and the Emerging Aviation Technologies sector to further refine future Australian UAS spectrum requirements, avenues for government support and necessary spectrum regulations.

Going forward

Existing aeronautical allocations in the Radio Regulations (notably 960-1 164 MHz) have been ruled out as an option for UAS spectrum as the frequency bands are already heavily encumbered for critical aeronautical navigation purposes. The quantum of spectrum required for future UAS operations is currently undefined and industry and government are encouraged to continue to work together in determine near and long-term requirements.

The ITU-R have been developing regulatory conditions for use of fixed-satellite service networks for CNPC and payload communications of UAS over a long period of time. Global CNPC use in FSS allocations most recently was a consideration of the ITU’s 2023 World Radiocommunication Conference (WRC-23) in Dubai.¹⁹ Unfortunately, this work did not progress at the conference.

Boeing Australia is of the view that formally mandated ITU-R regulatory conditions are not essential in this instance for the use of FSS allocations for RPAS communications in Australia.

Nonetheless, the fundamental ITU-R technical work has largely been settled and useful and relevant aspects of the studies are mature and can be the basis to expand spectrum access for UAS in non-segregated airspace. In Australia (under Region 3 identification) this includes 12.2-12.5 GHz, 12.5-12.75 GHz, 14-14.7 GHz and 29.5-30 GHz frequency bands. Supplementing this work with coordination between likeminded countries supported by ICAO standards and practices is a viable way forward.

Boeing Australia encourages the ACMA to use the ITU-R technical work as a basis for developing appropriate regulatory conditions to facilitate FSS spectrum for this use. This is conditional on no constraints to the FSS and procedures in place for safe operation of UAS, the remit of other regulatory agencies, such as the Civil Aviation and Safety Authority and Airservices Australia and ICAO standards and practices.

The ACMA through technical and regulatory spectrum determinations can support flexibility, capacity and reliability considering the wide range of opportunities and uses that are emerging in this dynamic market. Continued and deeper engagement on these issues is particularly important and encouraged.

¹⁹ WRC-23 agenda item 1.8 ‘to consider, on the basis of ITU R studies in accordance with Resolution **171 (WRC-19)**, appropriate regulatory actions, with a view to reviewing and, if necessary, revising Resolution **155 (Rev.WRC-19)** and No. **5.484B** to accommodate the use of fixed-satellite service (FSS) networks by control and non-payload communications of uncrewed aircraft systems’

Boeing Australia proposes the ACMA:

- Explore with a view to support and instigate the use of FSS allocations (based on work in ITU-R) for CNPC and payload access to spectrum for medium to large RPAS in cohort with ICAO standards and practices.
- Continue to support trials for UAS access to viable frequencies outside of the LIPD/ISM bands.
- Continue to support government and industry consultation and cooperation on frequency bands that may accommodate medium/large UAS communications for both CNPC and general payload and other options suited to explore alternative radio frequency access. In particular working with CASA to inform their understanding of radio frequency spectrum regulation for UAS.

General comments on the FYSO

The ACMA FYSO has been published each year since 2009 with minimal change. The format has a broad commentary in Part 1: Five-year spectrum outlook 20XX–XX and the detailed Part 2: 20XX–XX ACMA annual work program. The latter attracts the bulk of attention in industry submissions, whereas the former does not go into any detail of the ‘thinking’ of the regulatory aspects of evolving technologies.

In the current FYSO the separate consultation on evolving spectrum licenses (ESL) is referenced and rightly indicates that this work is a major longer-term focus for ACMA. However, apart from ESLs there is little that goes into specifics beyond 12 months ahead.

As an example, here are the specific out-years references in the current FYSO:

- 2030 – only item was on possible introduction of 6G
- 2029 – nothing
- 2028 – one reference ‘the expiring spectrum licences (ESL) project’ as a key priority for ACMA.
- 2027 – two references
 - Advanced Air Mobility (AAM) aircraft, or air taxi concepts that are crewed and uncrewed are rapidly maturing and progressing through certification processes, with a planned market introduction around 2027–28.
 - Universal Outdoor Mobile Obligation - The government to consult on and introduce legislation for UOMO in 2025, with implementation to take place in late 2027. (pgs. 13-14)

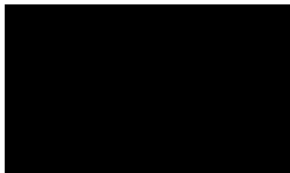
Boeing Australia and other radiocommunication industry stakeholders are directly involved in manufacture of devices reliant on radio frequency spectrum for operations. As an industry, design and development of new equipment is a long-term commitment. When spectrum, and radio frequency access is a part of this production, how the spectrum regulator views development of this technology and the regulatory challenges and impact, even while still formative, can assist industry in planning of radio frequency reliant goods. Noting, forward-looking views of the regulator would not reflect or usurp input by the Department or other Government agencies.

Boeing Australia encourages the ACMA

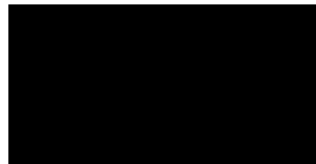
- to review the two-part structure of the FYSO with the aim to provide consolidated views of the regulator based on first hand interaction with other spectrum regulators and forward-looking communication industry bodies and manufacturers of radio frequency reliant equipment on the likely challenges and how the regulator may expect to respond in the out years of the FYSO.

Boeing Australia appreciates the opportunity to respond to the ACMA's forward spectrum planning in this submission.

Respectfully submitted



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List of abbreviations/glossary

Abbreviation	Definition
5G	Fifth generation mobile phone service
6G	Sixth generation mobile phone service (still in development)
AAM	Advanced Air Mobility
ACMA	Australian Communications and Media Authority (spectrum regulator)
APT	Asia-Pacific Telecommunity
ARNS	Aeronautical radionavigation service
ARSP	Australian Radiofrequency Spectrum Plan
AAUS	Australian Association of Uncrewed Systems
BLoS	beyond line-of-sight
CASA	Civil Aviation Safety Authority (Australia)
CEPT	Conference of Postal and Telecommunications Administrations (Europe)
CITEL	Inter-American Telecommunication Commission
CNPC	control and non-payload communication
DAA	detect and avoid
DITRDCA	Department of Infrastructure, Transport, Regional Development, Communications and the Arts (Australia)
DoD	Department of Defense (USA or Australia)
ESIM	earth stations in motion
FCC	Federal Communications Commission (USA)
FSS	fixed-satellite service
GHz	Gigahertz
GSO	geosynchronous orbit (of a satellite positioned above Earth)
ICAO	International Civil Aviation Organization
IMT	International mobile telecommunications
IoT	Internet of Things
ISM	Industrial scientific and medical
ITU	International Telecommunication Union
ITU-R	International Telecommunication Union - Radiocommunication Sector
KCC	Korea Communications Commission (Republic of South Korea)
LIPD	Low interference potential devices
LoS	line-of-sight
MHz	Megahertz
MIC	Ministry of Communications (Vietnam)
mmWave	Millimetre wave (spectrum roughly from 20-300 GHz)
NATO	North Atlantic Treaty Organization
NGSO	Non-geostationary satellite orbit (does not maintain a stationary position)
QoS	Quality of service
RLS	Radiolocation service
RPAS	remotely piloted aircraft systems
RR	Radio Regulations
UAS	uncrewed aircraft systems
WBB	wireless broadband
WRC	World Radiocommunication Conference

