Boeing Australia Holdings Pty Ltd
A.B.N. 42 101 168 932
Level 10, 10 Bridge Street
Sydney NSW 2000
Australia

Boeing Australia Holdings
response to
ACMA Draft allocation and technical instruments for the 3.4/3.7 GHz bands auction

Boeing Australia Holdings (Boeing Australia) appreciates the opportunity to respond to the ACMA consultation paper on the 'Draft allocation and technical instruments for the 3.4/3.7 GHz bands auction.'

Our response is specifically to the implications of protecting aircraft radio altimeter operations in the frequency band 4 200-4 400 MHz from interference from new wireless broadband (WBB)/5G applications operating in the nearby frequency range including the 3.4/3.7 GHz frequency under discussion in this consultation.

Radio altimeters are essential components in an aircraft for safe operation.
The radio altimeter is the only sensor on-board an aircraft providing a direct measurement of aircraft clearance over the terrain and other obstacles.

A radio altimeter is used during all phases of a flight, but significantly during precision approaches to landing, determining aircraft proximity to the ground, and collision avoidance systems. A failure in this sensor can lead to catastrophic results for the crew on board, passengers, and people on the ground.

Studies conducted internationally and referenced by the ACMA in the 'Coexistence between radio altimeters operating in 4200–4400 MHz and wireless broadband systems in 3400-4000 MHz report,' have analysed the impact of 5G/WBB systems in the frequency range 3 400-4 200 MHz. The studies have led to many countries introducing various mitigation measures to protect radio altimeters from interference from 5G/WBB transmissions.
Each country has different technical rollouts of 5G/WBB and consequently different mitigation measures to protect radio altimeters, i.e. one size does not fit all.

Meanwhile, the aviation industry is actively addressing the problem by developing new technical standards for radio altimeter equipment designed to reject spurious and unwanted emissions from 5G transmissions. This is a process that will take time as technical standards are still under development and equipment is to be manufactured and eventually installed in aircraft.

While Boeing Australia welcomes the interim mitigation measures proposed for 5G/WBB private networks allocated in the frequency range 3 800-4 000 MHz (not the subject of this consultation), we express our profound concern that similar mitigation measures are not proposed for spectrum licensed 5G operations across Australia in the frequency range 3 400-3 800 MHz i.e. the 3.4/3.7 GHz range. Boeing Australia does not accept that the ACMA has properly or correctly determined that mitigation measures are appropriate above 3 800 MHz but not necessary immediately below 3 800 MHz. This remains an ongoing concern to Boeing Australia and other Australian aviation industry interests.

The consultation paper has posed a number of questions to industry, both WBB/5G operators and aviation. Taking the above concern into consideration this submission responds directly to the questions asked.

General questions

Question 1 Are there current or potential future industry coordination mechanisms where WBB operators and the aviation community can coordinate and communicate regarding WBB deployments?

Boeing Australia response

It is essential that there is close coordination with WBB operators and primarily with the Civil Aviation Safety Authority in the deployment of all 5G/WBB base stations in the vicinity of airports regardless of ILS being present.

Under the proposed ACMA mitigations this would be relevant to ensure reduced power levels are maintained, siting of base station locations and mapping of protected runway zones applicable to ILS and IAP runways.

Furthermore, Boeing Australia supports aviation operator liaison with 5G/WBB MNOs to monitor and assess any statistical likelihood of, or real event failure of base station hardware or software and/or incorrect configuration of a base station such that the base stations performance might exceed spectrum licence operational conditions and impact radio altimeter performance due to unplanned/uncontrolled transmissions/emissions. Power and frequency monitoring (continuous and/or at scheduled intervals) need to be undertaken to ensure compliance. The ACMA should provide facilitation to support this requirement.

Additionally, Boeing Australia reiterates our serious and ongoing concern that ACMA has determined no mitigation measures are to apply to commercial 5G services operating at 3 400-3 800 MHz.

Question 2 What are your views on any or all aspects of the recent Canadian consultation that would be relevant in the Australian context. What, if any, aspects of the revised mitigations should be adapted for use in Australia, and why? (The Canadian regulator ISED has released a new consultation with revised proposed mitigations – RA Report Appendix C paragraph 7.66 onwards. These revisions have been based on a comprehensive body of laboratory and over-the-air testing work, as well as other considerations. While a full derivation of quantitative values proposed is not provided, this work contains additional insights relevant to Australian considerations.)

Boeing Australia response

The bench and live testing undertaken by Canada's ISED is world class and the mitigation recommendations across the frequency range operational in Canada should be reflected in the Australian experience.

The Canadian testing confirmed much of the established test outcomes for radio altimeter interference from C-Band 5G transmissions such as:

- While not showing an identifiable aircraft operational incident three radio altimeter units (two models) tested were shown to be affect by 5G transmissions.
  This is real world evidence that there is a problem. ACMA has long cited no evidence of any reported interference occurrences. For example, an erroneous altitude reading, even an obvious one, did not always result in a no compute data (NCD) or analog equivalent and could result in a higher or lower reading than the reference altitude.'

The extent, duration and many other factors can result in outputs from susceptible radio altimeter units affecting the operation of an aircraft in different ways.

- Susceptibility was identified at all test frequencies covering the 3 500 MHz, 3 800 MHz and 3 900 MHz frequency bands. All of these frequency bands are operational or will be operational in Australia with only the non-5G spectrum licensed 3 800-4 000 MHz subject to mitigation measures.
- Susceptibility events can be prolonged when the radio altimeter indicates an NCD or an analog warning/error flags.
- Recovery time can vary based on radio altimeter design and environmental conditions.
- A strong correlation was observed between the OTA results and ISED's laboratory break points.

Based on the above non-exhaustive summary ACMA should be applying the same mitigation measures proposed above 3 800 MHz to the entire 3 400-4 000 MHz frequency range in Australia.

WBB deployment questions

Question 3
Are the findings from the NTIA ITS report regarding 5G base station emission levels and pattern measurements applicable to Australian WBB deployments? If not, on what basis would equipment deployed in Australia have a materially different performance than the emission levels and pattern measurements outlined in the NTIA study? What are the implications and costs of using equipment that does meet the measurements observed by the NTIA study?

Boeing Australia response

While this question appears directed to MNO Boeing Australia makes the following observations on the report.

Taking into consideration that the NTIA ITS report is specific to the US 5G environment (i.e. different frequency range and power levels and a rollout of C-Band transmissions in its infancy) that differs from Australia, the findings nonetheless have relevance to 5G operations in Australia.

Boeing Australia concurs with the report's findings that:

- the technical solution to unwanted and or spurious emissions from 5G base stations interfering with the current operation of aircraft radio altimeters is the installation or retrofitting of more-effective RF power-rejection filters on radio altimeter receivers for frequencies below 4 200 MHz.
  Noting that industry considers filters may not be sufficient for lower category radio altimeters and therefore need to be replaced with compliant and more robust units.
- That airborne radiation patterns show measurably, significantly less power than is found in 5G base station main antenna beams directed toward UEs at ground level.
  The amount of power reduction in the sky is variable and needs to be examined by researchers in detail.

Question 4

What are the effects on WBB deployments if all WBB deployments were restricted to an EIRP of 62 dBm/MHz (rather than a TRP limit) on an ongoing basis (other than those in restricted cell segments with lower powers)? If any, what are the implications and costs of being restricted to this EIRP value, and is there an alternative that would be practicable and appropriate?

(The NTIA ITS report notes practical limitations on current equipment limiting operation to an EIRP of 62 dBm/MHz for most bandwidths. The majority of current Australia deployments operate below this figure, as per the RA report Appendix.)

While this question appears directed to WBB/MNOs Boeing Australia makes the following observation.

Boeing Australia sees benefit in the use of EIRP levels rather than TRP as a transmitter output measure as the emissions of a base station are less susceptible to significant variations. Whereby the emissions of a base station with a TRP power limit can be subject to operational variations particularly associated with active antenna systems, antennae pointing, antennae height and other technological influences often unique to 5G transmissions.

As ACMA has noted for unwanted emission limits into the radio altimeter frequency band ‘using an EIRP limit as opposed to a TRP/conducted power limit provides greater certainty as to the coexistence environment.’

Question 5

What, if any, are the implications if conducted unwanted emission levels are specified lower than the 3GPP TS.38.104[1] spurious domain Category B limits of -30 dBm/MHz (or a TRP equivalent) specifically considering possible ongoing limits of -33 dBm/MHz, -35 dBm/MHz, -40 dBm/MHz or -48 dBm/MHz? Where applicable, both equipment nominally designed for both band n77 and n78 band equipment should be considered, with spectrum allocations up to 3800 MHz for n78 equipment and 4000 MHz for n77 equipment assumed.

(The NTIA ITS report indicates that, in practice, 5G base stations have better unwanted emissions levels – i.e., have lower emissions – than included in 3GPP specifications.)

While this question appears to be to WBB/MNOs Boeing Australia makes the following observations.

Large airplanes having radio altimeters with the interference tolerance referred to as ‘Group 2’ can experience interference from 5G ground stations transmitting up to 3.67 GHz with a spectral flux density of as low as -49 dBW/m^2/MHz when an aircraft is operating below 1,000 feet (305 metres) above ground level.
A 62 dBm/MHz transmitter can produce this power level at a distance of 1.8 nautical miles, while a 65 dBm/MHz signal can reach this level at a distance of 2.5 nautical miles.
Therefore, separation distances between cellular towers and areas where aircraft may experience hazards will need to be maintained, depending upon the power level(s).
These numbers presume large airplanes are using radio altimeters with the worst tolerance to interference.

[1] E.g. see ETSI TS 38.104 version 16.4.0 Release 16 Table 6.6.5.2.1-2: General BS transmitter spurious emission limits in FR1, Category B

Radio altimeters meeting a category referred to as ‘Group 4’ have much higher tolerance thresholds and can tolerate a 65 dBm/MHz fundamental 5G emission up to the frequency 3.8 GHz as close as 35 feet (10 meters), effectively removing tower siting as an issue for fundamental emissions.

Conducted spurious 5G emissions in the 4.2-4.4 GHz range must also be assured to be approximately -48 dBm/MHz since similar safety risks are posed by spurious emissions. This tolerance would allow 5G transmitters to be treated as normal physical obstacles from a safety perspective without concern for interference, as long as there were no towers taller than approximately 450 feet (130 m) near airports. For 5G frequency ranges between 3.8 and 4.2 GHz and above 4.4 GHz, Group 4 radio altimeters require some limitations on 5G characteristics, such as power versus elevation and tower height, for the physical obstacle argument to continue to hold true.

Due to the critical safety risk, any foreseeable interference conditions must be mitigated. Numerous radio altimeter designs have been certified and are operating on certain Boeing airplanes, with a very large range of robustness to adjacent radio frequency band interference. However, a significant number of Boeing airplanes operating in Australia in the past twelve months are equipped with radio altimeters that do not fall within the Group 4 category. Replacements of those radio altimeters with Group 4 radio altimeters would ensure full compatibility with 5G cellular systems operating in the 3.3 to 3.8 GHz range (and up to 4.0 GHz) with a power level as high as 65 dBm/MHz EIRP in any direction.

Absent a radio altimeter upgrade program for large airplanes operating in Australia, Boeing Australia supports temporary areas where 5G towers cannot be permitted to operate.

Question 6

Can WBB equipment comply with the ACMA proposed interim unwanted emission EIRP limits proposed in the RA report main body and Appendix D, in addition to the TRP and conducted per port limits proposed in the sample spectrum licence contained in the marketing plan? What, if any, are the implications if unwanted emissions are specified as an EIRP rather than a TRP or conducted limit on an ongoing basis?

This appears is to be relevant to WBB stakeholders.

See 4 and 5 above for Boeing Australia comments.

Question 7

What evidence is there for using lower maximum side-lobe gains, and what alternative value could be used? What would be a practical elevation pattern envelope that both non-AAS and AAS WBB base stations could reasonably implement and commit to, in order to manage grating lobes and beam pointing?

(The interim mitigation zone calculations use an assumed WBB antenna side-lobe gain level of 18 dBi, as per RA report Appendix D. We note feedback from some TLG members that suggests this value is significantly too high.)

This appears is to be relevant to WBB stakeholders.

Question 8
Are there any technical limitations for WBB AAS base station systems that would make compliance with a requirement to not scan or point the main beam above the horizon impracticable to implement?

While this question appears to be to WBB/MNOs Boeing Australia makes the following observations.

Boeing Australia recommends antenna down-tilt restriction be in place across Australia to protect interference to radio altimeter units in low altitude operations outside restricted runways for search and rescue operations and medical evacuations often effected by helicopters.

Bench and OTA testing consistently shows that antenna down tilt reduces interference to susceptible radio altimeters from 5G transmissions across an aircraft flight path at low levels.

Aviation spectrum use questions

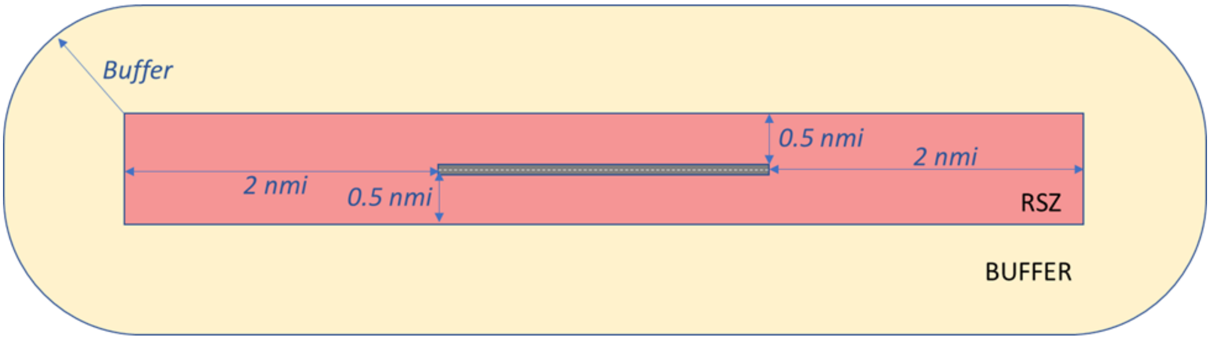
Question 9
Given that the proposed interim mitigations were determined using a single take-off/landing scenario, what evidence is there for other critical scenarios (such as deviation from normal flight paths beyond the margin already applied to the glideslope angle) around airports that would require consideration? If there are such scenarios, based on the same methodologies currently used, what would the required zone shapes and sizes be?

Boeing Australia response

Boeing Australia recommends that 5G base stations transmitting up to 62 or 65 dBm/MHz in the 3.4-3.8 GHz frequency range be activated such that the limit of -49 dBW/m^2/MHz is not exceeded in the runway safety zone (RSZ) at all runways where the current fleet of non-Group 4 radio altimeter equipped large airplanes operate.

To accomplish this, Boeing recommends not activating 5G base stations in the RSZ or within a buffer distance from the RSZ, as illustrated below, where the buffer size depends on maximum transmitted power as detailed in the table below. This approach would also likely cover all surface taxi and gate areas where radio altimeters must operate normally to avoid disruption to operations because airborne radio altimeter tolerances require larger separation distances.

The power levels referenced here are maximum levels however the lower Australian power level is also relevant.



Max 5G Power Level	62 dBm/MHz EIRP Fundamental 3.3-3.67 GHz (-48 dBm/MHz Conducted Spurious 4.2-4.4 GHz)		65 dBm/MHz EIRP Fundamental 3.3-3.67 GHz (-48 dBm/MHz Conducted Spurious 4.2-4.4 GHz)	
RA Installations / 5G Height Limit / 5G Elevation Mask / 5G Location	Height < 130m With or Without Mask **In RSZ, No Buffer**	Height < 130m With or Without Mask **Outside RSZ + Buffer (nmi)**	Height < 130m With or Without Mask **In RSZ, No Buffer**	Height < 130m With or Without Mask **Outside RSZ + Buffer (nmi)**
Group 1 (No RA Data, Regional Jet, General Aviation)	All AD Ops Restrictions	All AD Ops Restrictions	All AD Ops Restrictions	All AD Ops Restrictions
Group 2 (e.g., ERT-530)	All AD Ops Restrictions	Limited or No Risk in RSZ with Buffer = 1.8 nmi	All AD Ops Restrictions	Limited or No Risk in RSZ with Buffer = 2.5 nmi
Group 3 (e.g., ERT-550, LRA-700, LRA-900, 860F-4)	All AD Ops Restrictions	Limited or No Risk in RSZ with Buffer = 0.8 nmi	All AD Ops Restrictions	Limited or No Risk in RSZ with Buffer = 1.2 nmi
Group 4+ (e.g., ALA-52B, ERT-550R, 860F-4+filter, LRA-900 upgrade, LRA-2100)	Compatible	Compatible	Compatible	Compatible

Question 10
What is a practicable and demonstrable timeframe for the replacement of the affected aircraft radio altimeters fleet to meet the proposed revised DO-155A/MOPS and the expected subsequent FAA technical standard order (TSO), which would be expected to be adopted globally?

Boeing Australia response

- MOPS are still under development. There is an expectation higher in-band interference tolerance against 5G C-band spurious emissions is needed (see answer to Q 11 below). OEMs will need time to design and develop and build equipment that meets the specified increased resilience and possibly beyond for future proofing radio altimeters from further IMT/5G or 6G applications.
- Once the MOPS are approved, the manufacturer must build a specific model of radio altimeter for technical authorisation such as FAA. This may take one or more years to move a prototyped design to a final design.
  As noted by ACMA the FAA standard would be adopted globally and certainly by Australia which is an additional time component.
- Only after the above can an operator (airline) or aircraft manufacturer begin installing the new radio altimeter devices. Typically a full fleet retrofit may take 10 years to complete (based on US and Canadian advice), and even under expedited actions, a retrofit would require 12 to 18 months, depending on the extent of cabling or antenna replacement required. For faster installation, aircraft may need to be taken out of service significantly impacting airline operations.
- Finally, availability of new radio altimeters for installation based on the US experience is expected to be delayed by production supply issues.
  This can be further exacerbated through global retrofit demands, countries will require the same modification as quickly as possible.
  There is no likelihood Australia will have preferential treatment to secure replacement units ahead of other countries.

Question 11
If the draft RTCA DO-399 is adopted to form the new DO-155A/MOPS standard, what evidence is there for any ongoing mitigations after a MOPS- based replacement and what should they be, based on similar methodologies to the ACMA methods?

Boeing Australia response

It is expected the MOPS under development support resilience to the level consistent with Group 4 category radio altimeter units.

RTCA DO-399 will be an input to the new MOPS however, the base station out-of-band emissions will be needed in the future as well as considerations/mitigations for base stations using spectrum close to the radio altimeter frequency band.
Additionally, Boeing is currently assisting industry to develop more advanced new radio altimeter standards that may require performance above Group 4 to maximise efficient use of spectrum and compatibility with adjacent frequency bands. Several more years will be required to publish these new standards, then certify avionics and aircraft to those standards and equip fleets with updated avionics.

Therefore, ongoing coordination is crucial for compatibility with any terrestrial system deployments at frequencies closer to the 4.2-4.4 GHz frequency range to maintain aviation safety until such time that the standards and fitted equipment is robust enough to operate against current and future International Mobile Telecommunication services.

Question 12
What are suggested processes for the consideration of adding new approaches to the identified runways list in areas where WBB has already been deployed, during the period of interim mitigations?

Boeing Australia response

Boeing Australia supports ISED's proposal to define exclusion zones of 80 metres radius centered at the heliport final approach and takeoff. In addition, protection of all approach surfaces out to 1,050 metres would be appropriate to cover the entire approach and all critical phases of approach.

Fundamentally selection of specific airports and the establishment of RSZs, or exclusion zones is the remit of CASA.

It is noted ACMA maps of deployments around example airports Figure 24: 'Deployments near Brisbane' is out of date, neglecting the new parallel runway and still showing the old cross runway. This raises issues of currency for even the sites currently operating 5G and where new sites might be located.

Clearly the establishment of RSZ and exclusion zones is a significant matter that needs to be carefully determined and reviewed on a regular basis subject to airport developments and any intentions of operators to establish WBB near airfields.

Interim radio altimeter retrofit questions, including cost implications

Question 13
What are the costs and operational implications to complete an interim retrofit of filters (or make other changes as necessary) to radio altimeters on affected aircraft operated in Australia by 31 March 2025?

(This would be in a similar manner to the US interim retrofit to the performance level of a 'radio altimeter tolerant airplane', as described in the FAA proposed revised Airworthiness Directive.)

Boeing Australia response

The operational implications of retrofitting units to aircraft is covered under our response to Q 10 above.

Additionally, operators will have different processes and expertise to install units and manage consequential out-of-service issues associated with the retrofit of aircraft. In many cases operators look to retrofit as part of standard maintenance, but this is only possible when replacement units are available and services can accommodate the time involved for retrofitting.

For reasons stated in the response to Q 10 a target date of 31 March 2025 to complete retrofitting of all Australian registered airplanes as well as international airplanes using Australian airspace can only be an aspirational date.
Boeing Australia is of the view that based on current experience of retrofitting aircraft in the United States, and striving for standards exceeding the current Group 4 to accommodate new IMT developments deployed adjacent to radio altimeter allocations, for Australia more time will be necessary.

Question 14
To support an answer to question 13, what evidence is there to determine the size of the Australian aircraft fleet required to undergo an interim retrofit?

Boeing Australia response

As of 22 March 2023, there were a total of 225 Boeing commercial airplanes registered in Australia.
Of this fleet only 42 were originally fitted with Group 4 radio altimeters, those being the 717 and 787 models.
All other airplanes are Group 3 or lower and more susceptible to 5G interference in varying degrees.
It is expected a small number of the susceptible aircraft have been, or are, in the process of retrofitting. Below is the list of Boeing registered commercial aircraft in Australia.

Model	Count
B38M	**4**
737-8	4
B712	**20**
717-200	20
B722	**1**
727-77	1
B733	**7**
737-319	2
737-36N	1
737-376	3

737-3U3	1
B734	**1**
737-4S3	1
B737	**8**
737-79L	1
737-7FE	2
737-7K2	5
B738	**157**
737-800	7
737-81D	2
737-838	75
737-85R	1
737-8FE	64
737-8KG	2
737-8SA	6
B763	**3**
767-381F	1
767-3JHF	2
B77W	**2**
777-3ZGER	2
B788	**11**
787-8	11
B789	**11**
787-9	11
Grand Total	**225**

Additionally, international flights from non-Australian registered airplanes must also be considered. These airplanes can be from any country and will need to comply with a retrofit deadline and operate in accordance with any determined mitigation measures in place in Australia.

To understand the extent of this issue, as at the 12 months ending 22 March 2023 there were 1,251 Boeing airplanes operated in Australia ~493 had Group 4 5G tolerant radio altimeters at delivery per Boeing delivery records. As previously mentioned, of the Australian Boeing registered airplanes, 42 had Group 4 at delivery.

Of the approximately 220 airplanes registered in Australia and operating in Australia, we have heard feedback on ~100 airplanes, with 20 reporting having the Group 4 installed, and ~80 reporting no plans to upgrade due to no plans to fly to the U.S, where airplanes are prohibited from certain airports if flying with noncompliant radio altimeters.

The domestic situation feeds a serious contradiction….

If the spectrum regulator decrees

- there is no interference issue for aircraft from 5G transmission across 3 400-3 800 MHz, and
- in the frequency range 3 800-4 000 MHz subject to ACMA mitigation measures there are virtually no WBB/5G private networks established near airports,

then where is the need for operators to retrofit?

The scenario above wrongly engenders a high degree of complacency created by the evolving position of the ACMA on protection of radio altimeters from C-Band WBB/5G transmissions in Australia.

Question 15 What are your views of the costs referenced by the FAA in the proposed revised AD, if they were to be used to estimate costs for an interim retrofit for aircraft in Australia?

Boeing Australia response

The figures arrived at by the FAA to retrofit US aircraft fleets, by the FAA's admission are based on limited information and incomprehensive data.

The FAA costs are forward projections from the time of the AD and does not include costs already incurred by operators and manufacturers.

The FAA projected costs have been disputed by the International Air Transport Association (IATA) that says costs to retrofit airplanes would far exceed the $26m USD estimated. IATA says the figure would be closer to $637m USD thereby bringing into question the $25,000 per aircraft figure from the FAA estimates.

IATA says the FAA figures 'significantly underestimates the average cost of either a filter upgrade or a full radio altimeter replacement. One of the leading airlines in the world confirmed to IATA a cost of $52,000 per aircraft for upgrades of existing radio altimeters and a cost of $80,000 per aircraft for full radio altimeter replacements.'

Furthermore, the Airlines for America (A4A) organisation says the number of outstanding retrofits on July 1 2023 will be substantially greater than the FAA estimate of 1,000. The A4A recently surveyed members and found they have spent ~ $80 million to date.

Question 16 What are the cost and operational implications for the aviation sector if the interim mitigation period is extended from the proposed 31 March 2025 date? (Data on a possible yearly extension of the end of interim mitigations is also requested; i.e., separate cost and operational implications also provided for 31 March 2026, 2027, etc – interim mitigation end dates).

In instances whereby aircraft with Group 3 or less radio altimeters may be able to access some ILS restricted airports denial of service will be an operational costs to operators.

Otherwise, affected aircraft still need to be retrofitted. Operators will be subject to product price increase through an extended period to retrofit.

The total Boeing commercial global fleet of active airplanes as at August 2021 was 15,081 and a further 8,688 in active airplanes. Of the latter some of these airplanes may have been in temporary decommissioning due to the pandemic impact on air travel and may now have come back into service.

Boeing commercial global fleet in service/out of service as at August 2021

MODEL	ACTIVE AIRPLANES	INACTIVE AIRPLANES
707	151	861
717	144	12
727	178	1,654
737 Classic	1,449	1,683
737 MAX	545	2
737 NG	6,888	191
747	663	901
757	761	289
767	1,022	206
777	1,587	82
787	1,007	4
DC10/MD10	99	347
DC8	18	538
DC9	62	914
MD11	127	73
MD80	376	818
MD90	4	113
Total:	15,081	8,688

Costs associated with retrofitting non-compliant aircraft are expected to be as detailed above in the IATA response to costings estimated by the FAA.

Question 17

What are the expected impacts on WBB deployment plans, costs and business cases if interim mitigations cease on 31 March 2025? What are they if the interim mitigations period is extended?

(Data on a possible yearly extension of the end of interim mitigations is also requested; i.e., separate impacts on WBB deployment plans, costs and business cases also provided for 31 March 2026, 2027, etc – interim mitigation end dates).

This appears is to be relevant to WBB stakeholders.

Respectfully submitted,

Maria Fernandez
President
Boeing Australia,
New Zealand and South Pacific

Neil Meaney
Regional Director Asia-Pacific
Global Spectrum Management
Boeing Australia Holdings

29 March 2023

ATTACHMENT

List of abbreviations

Abbreviation	Term
A4A	Airlines for America
AD	Airworthiness Directive (issued by the FAA)
CASA	Civil Aviation Safety Regulator (Australian Government)
EIRP	effective isotropic radiated power
FAA	Federal Aviation Administration (US Government)
IAP	Instrument Approach Procedure
IATA	International Air Transport Association
ILS	Instrument Landing System
IMT	International Mobile Telecommunications (Mobile phones including 5G services)
ISED	Innovation Science and Economic Development (Canadian spectrum regulator)
MNO	mobile network operator (5G generally)
MOPS	Minimum Operational Performance Standards
NCD	non-compute data
NTIA	National Telecommunications and Information Administration (US Government)
OEM	original equipment manufacturer
OTA	Over-the- air (testing)
RSZ	runway safety zone
RTCA	Radio Technical Commission for Aeronautics,
TRP	total radiated power
UE	user equipment
WBB	wireless broadband (includes 5G services and variants)