

8 May 2024

The Manager
Spectrum Licensing Policy Section
Australian Communications and Media Authority
PO Box 13112 Law Courts
Melbourne VIC 8010

RE: Consultation on Five-year spectrum outlook 2024-29 and 2024-25 work program

Thank you for the opportunity to comment on the Australian Communications and Media Authority (“ACMA”) consultation regarding the draft Five-year spectrum outlook (FYSO) draft 2024-29 and 2024-25 work program. As an established entity in the Australian space industry, Fleet Space Technologies Pty Ltd (“Fleet Space” or “Fleet”) is committed to working with the ACMA to ensure that the Australian radiocommunications regulatory regime remains relevant and effective.

Fleet Space is an Australian space-enabled exploration technology company, providing advanced detection capabilities and communication services for exploration sensors and robotic systems for commercial and defence applications. Fleet has a long track record of developing innovative systems and is the global leader in using low Earth orbit microsatellite narrowband communications to deliver novel, end-to-end capabilities. The company’s key capabilities are low-power, high performance edge computing in small spacecraft applications as well as additive manufacturing for space hardware.

Fleet Space has recently been recognised by the Australian Financial Review (AFR) as the fastest growing company in Australia, with a compound annual growth rate of 582% over three years. Fleet’s team of over 140 employees includes a world-class team of space and communications engineers, scientists, defence industry specialists and geophysicists based in Australia. The company has raised over AUD \$100M to date and has demonstrated multiple commercial capabilities, including the ability to dramatically accelerate the subsurface detection capability for critical minerals needed to decarbonise our global economy.

Fleet’s flagship product, ExoSphere is a space-enabled solution for mineral exploration, detecting critical minerals in real-time, in 3D, and under cover with very low environmental impact. Since launching ExoSphere in March 2022, Fleet has signed contracts with over 30 clients including Rio Tinto, Barrick Gold and Core Lithium, and completed over 350 Ambient Noise Tomography surveys, more than any other company in the world.

In early 2023, Fleet secured a \$6.4M contract with Australia’s Defence Space Command to deliver the ASCEND2LEO program, where Fleet will demonstrate a low Earth orbit (LEO) sovereign satellite communications system focused on tactical communications and data transmission beyond line of sight where connectivity is limited.

In June 2023, Fleet was also awarded a \$4M contract with the Australian Space Agency for its Moon to Mars: Demonstrator program. This mission will result in a version of Fleet's proprietary ExoSphere solution being deployed on the lunar surface in the search for water ice at the Moon's South Pole.

Specific Fleet Space comments on the Consultation Paper can be found in **Attachment A**.

Fleet's submission focuses largely on the spectrum needs and priorities of small satellite, low earth orbit (LEO) operators, particularly with respect to the provision of spectrum that is allocated to the Earth Exploration Satellite Services (EESS) and Mobile Satellite Services (MSS). Fleet's focus on MSS and EESS is not to say that other users of the radio spectrum are less important or valuable. Indeed, Fleet recognises the extensive use of the radio spectrum for other applications both in the terrestrial and space domains, government or commercial.. Fleet's focus simply reflects where we consider the ACMA should prioritise its work program over the coming years.

If you require any further information or wish to discuss any aspects of the comments contained in this submission, please contact Andrew Lloyd, Lead Spectrum Engineer, at

[REDACTED]

Yours sincerely

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Federico Tata Nardini

Chief Financial Officer & Director
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ATTACHMENT A – SPECIFIC COMMENTS ON THE CONSULTATION PAPER

1. BAND PLANNING

A. *Bands being studied under WRC-27 agenda item 1.7*

- A.1. The 8025-8400 MHz portion of the 7125-8400 MHz band is a key band for conducting gateway downlink operations for non-geostationary orbit (NGSO) Earth Exploration satellites as well as the extensive military use. This band is a core and vital frequency band for small satellite operators with existing and already committed investments as demonstrated by the prevalence of the band among Ground Station as a Service (GSaaS) providers.
- A.2. At WRC-19, over 17 GHz of millimeter-wave spectrum was identified for IMT. Additionally, more mid-band spectrum was further identified for IMT at WRC-23, which today remains largely unused.¹ Considering that the 8025-8400 MHz frequency range is crucial for satellite operations and in the absence of sufficient justification explaining why existing IMT allocations can't meet real demand; Fleet opposes any IMT designation within the 7125-8400 MHz band.

B. *2 GHz MSS (1980–2010 MHz and 2170–2200 MHz)*

- B.1. Fleet commends the ACMA efforts to support innovative satellite applications through their introduction of the 2x 5MHz (2005-2010 MHz paired with 2195-2200 MHz) that is dedicated for satellite IoT and similar narrowband services on a shared basis. Fleet encourages the ACMA to consider their feedback on these arrangements in the recent consultation on the Technical Design Features and Allocation Considerations for the 2 GHz MSS band.
- B.2. In brief, Fleet supports a review of the following narrowband MSS CSO class licence requirements:
 - B.2.1. *The EIRP of transmitting earth station must not exceed -7 dBW*
 - B.2.1.1. The arrangements in their current form are restrictive to modern technologies. The maximum equivalent isotropically radiated power (EIRP) and minimum bandwidth do not support spread spectrum protocols.
 - B.2.1.2. The use of spread spectrum emissions is conducive to operations on a no interference, no protection base, by minimising the levels of interference that is caused to other operators and simplifying the coordination process. In aggregate, the power propagated on a network level is much lower than the power that would be transmitted by the networks that operate with a narrower bandwidth.
 - B.2.1.3. To accommodate spread spectrum systems, Fleet would propose that this requirement be expressed in terms of EIRP spectral density (EIRPsd), instead of maximum EIRP and minimum bandwidth.
 - B.2.1.4. Fleet proposes that this requirement be rescinded, and replaced with a requirement that limits the EIRPsd of the emissions in the 2005-2010 MHz band to 17.3 dBW/MHz
 - B.2.2. *For EIRP power spectral densities greater than 0.5 dBW/Hz...the duty cycle may not exceed/is limited to...% average over a 15-minute period.*

¹ See Global Satellite Operators Association WRC-23 Positions, Nov. 27, 2023. GSOA

- B.2.2.1. Satellite passes in LEO can last 10-15 minutes depending on the latitude of the user terminal and the orbit of the satellite. A duty cycle requirement rated over 15 minutes does not allow small constellations to support commercial services where there is only a satellite available overhead at limited 10-15 minutes windows during the day.
 - B.2.2.2. Fleet proposes that the duty cycle requirement should be rated as an average percentage over a 24-hour period rather than over a 15 minutes period.
- B.3. Regarding the remaining 2x 25 MHz (1980-2005 MHz paired with 2170-2195 MHz) portion of the 2 GHz band, Fleet recommends that the ACMA take a similar approach to the 2x 5 MHz narrowband arrangements and introduce a light touch regulatory framework that supports low barrier to entry for innovative satellite applications.
- B.4. To that end, Fleet does not support the proposed competitive price-based allocation mechanism for the 2 GHz MSS spectrum. Whilst Fleet acknowledges the difficulties regulators face when spectrum demand exceeds supply, Fleet has strong concerns about the effectiveness and efficiency of price-based competitive bidding for exclusive allocations of satellite spectrum.
- B.5. The European Union (EU) presents a useful case study to further understand the merits (or lack thereof) of a price-based exclusive spectrum allocation. In 2009, Inmarsat and Echostar (formally Solaris) were granted exclusive pan-EU wide licences for the 2 GHz MSS band by the European Commission through a price-based allocation.² To date, each operator's 2x 15 MHz allocation has been underutilised with only limited aeronautical services being introduced by one of the operators in 2017.³ The other operator has not declared any collected revenue after holding the licence for 13 years.⁴ Over this time, new entrants with readily deployable, innovative technology were precluded from using this spectrum due to the exclusive allocation of the licence.
- B.6. In the United States, Congress has expressly prohibited "competitive bidding [for] orbital locations or spectrum used for the provision of international or global satellite communication services",⁵ due to concerns that successive spectrum auctions in numerous countries could threaten the viability and availability of global satellite services.⁶ In addition, the multi-year period required for the design, construction and launch of satellite systems requires significant upfront investment before licencing. The high uncertainty created by spectrum auctions could disrupt the availability of capital for such projects.⁷
- B.7. To that end, Fleet cautions the ACMA against proceeding with a price-based allocation and encourages the ACMA to instead consider a more holistic assessment process for allocating the spectrum.

² See RSPG23-042: Draft RSPG Opinion on assessment of different possible scenarios for the use of the frequency bands 1980-2010 MHz and 2170-2200 MHz by the Mobile Satellite Service beyond 2027. *Radio Spectrum Policy Group, European Commission*. 25 October, 2023

³ See i.d.

⁴ See i.d.

⁵ See Commercial Launch FNPRM at n.210 (citing 47 U.S.C. § 765(f)).

⁶ See Amendment of Parts 2 and 25 of the Commission's Rules to Permit Operation of NGSO FSS Systems Co-Frequency with GSO and Terrestrial Systems in the Ku-Band Frequency range, et al., Memorandum Opinion and Order and Second Report and Order, 17 FCC Rcd 15849 at n.600 (2002) (citing Report of Committee on Commerce, Communications Satellite Competition and Privatization Act of 1998, H.R. Rep. No. 494, 105 Cong., 2nd Sess. 64-65 (1998)).

⁷ See i.d.

- B.8. **First and foremost, Fleet is of the view that the amount of spectrum allocated to an operator on an exclusive and limited basis should be minimised, particularly in the 2 GHz bands which are a critical band for small satellite LEO operators.** Maximising the amount of 2 GHz MSS spectrum allocated for shared use between satellite operators will promote healthy market competition and incentivise incumbent operators to maximize their use of the available spectrum by investing in newer spectrally efficient technologies to improve capacity. Spectral efficiency plays a critical role in steering competition in downstream markets. In the absence of effective competition, market power can be leveraged by holders to the detriment of consumers and lead to inefficient outcomes.
- B.9. To manage the competing demand for the spectrum, Fleet would propose a holistic assessment of an operator's proposed spectrum utilisation. Particularly with respect to the MSS operator's ability and motivation to share spectrum as well as the public and national interest benefit to Australia. This approach would be akin to the Processing Round procedure implemented by the Federal Communications Commission for NGSO-like satellite systems which was used effectively to establish and promote a sharing environment among NGSO systems that would provide a measure of certainty.⁸
- B.10. MSS technologies like 3GPP 5G non-terrestrial networks (NTN), aim to offer supplementary coverage for terrestrial 5G/6G networks and necessitate exclusive band usage. For these types of MSS applications, Fleet believes it is more appropriate for these direct-to-smartphone devices to operate under the same technical framework and within the same bands as existing LTE equipment, through spectrum access agreements with the incumbent mobile carriers. Simply reusing the available 60 MHz spectrum of the adjacent 1920-1980 MHz band for earth-to-space links would be a spectrally efficient solution and would open up the entire 2x 25 MHz of 2 GHz MSS spectrum for shared licensing purposes.

2. OPTIMISING ESTABLISHED PLANNING FRAMEWORKS

A. *Satellite Planning*

- A.1. Fleet commends the ACMA's recent investigations into the suitability of Australian regulatory arrangements and spectrum access for satellite direct-to-mobile services. The ACMA has a unique opportunity to empower telecommunication carriers to leverage the distinct advantages of the advanced small satellite technology that is now available in the marketplace. Fleet encourages the ACMA to continue to take on a leadership role in designing a fit-for-purpose regulatory framework to support the roll-out of direct-to-mobile services in Australia. Direct-to-mobile connectivity represents the dawn of a new era with the introduction of truly ubiquitous mobile service.
- A.2. In practice, direct-to-mobile is an extension of terrestrial mobile services, with the underlying objective of a seamless experience for the user. Indeed, in the United States, the Federal Communications Commission (FCC) indicated their view of direct-to-mobile as being “an enhancement to terrestrial mobile service

⁸ See Order and Authorisation. In the matter of Kuiper Systems, LLC, Application for Authority to Deploy and Operate a Ka-Band Non-Geostationary Satellite Orbit System. IBFS File No. SAT-LOA-20190704-00057. Call Sign S3051. July 30, 2020.

and not a standalone service”.⁹ Further, noting that these mobile devices are not earth stations, to the extent that they are primarily intended for use within the mobile service.

- A.3. Whilst, the ITU Radio Regulations contain distinct definitions for space radiocommunications and space stations; these regulations do not prevent the ACMA from determining that a mobile antenna situated on a satellite can function within the Mobile Service. Additionally, the current definition of the Mobile Service (both internationally and domestically) is broad enough to accommodate direct-to-mobile services. This definition encompasses communications between "mobile stations," which are designed for use while in motion, need not be land-based, and have no maximum altitude specified.¹⁰
- A.4. Indeed, Mobile Satellite Services (MSS) technologies like 3GPP 5G NTN aim to provide additional coverage for terrestrial 5G/6G networks and require dedicated spectrum usage. In the case of these MSS applications, Fleet suggests that it would be more appropriate for direct-to-smartphone devices to operate within the same technical framework and frequency bands as existing LTE equipment. This could be achieved through spectrum access agreements with the current mobile carriers. Simply utilizing the available 60 MHz spectrum within the adjacent 1920-1980 MHz band for earth-to-space links would represent a highly efficient use of spectrum. It would also enable the entire 2x 25 MHz of 2 GHz MSS spectrum to be utilized for shared licensing purposes.
- A.5. To that end, Fleet is of the view that the ACMA should undertake active investigations to identify bands with allocations for the mobile service on a primary service that could support direct-to-device arrangements whilst preserving spectrum options for small satellite services.

B. Low Interference Potential Devices (LIPD)

- B.1. Fleet recognises the ACMA ongoing activities to support IoT Earth station transmitters in the 900 MHz and 2.4 GHz bands under the existing LIPD framework. However, it should be noted that without a suitable paired downlink band available for these transmitters, other bands used for MSS downlink will become congested.
- B.2. Fleet supports the ACMA continued consideration of the authorisation of IoT Earth station receivers in the 900 MHz and 2.4 GHz band.

C. Ongoing review of spectrum planning, assignment and coordination requirements

- C.1. Fleet is of the view that the ACMA must work toward a more flexible regulatory authorisation framework given the rapid acceleration of new technologies linked to the enhanced national and global needs of consumers of these technologies, the need for ACMA to be far more agile in enabling these technologies is needed.
- C.2. Fleet strongly encourages the ACMA to consider arrangements for low power geophysical earth stations that operate within the Earth Exploration Satellite Service (EESS) as a near-term work program. EESS spectrum is a critical enabler of novel and innovative exploration technology particularly those dedicated to the mapping and identification of Australian critical mineral resources.

⁹ See Single Network Future: Supplemental Coverage from Space, FCC 23-22 (rel. Mar. 17, 2023) (“NPRM”)

¹⁰ See ITU Radio Regs., Ch. 1, Art. 1.24 (mobile service), 1.67 (mobile station)

- C.3. These types of devices are nominally deployed in remote and rural locations and are itinerant by nature, as required by the nature of exploration projects.
- C.4. Fleet acknowledges that this type of EESS application is not currently considered under the existing regulatory environment and Fleet recognises the ACMA’s long-standing approach of licensing individual EESS earth stations at specified sites. However, under this approach, each earth station would potentially need to be licensed for every location it operates from. In this scenario, operators like Fleet, with low-power itinerant earth stations, could be applying for 100s of new licences every week, which would impose an untenable administrative burden for all parties and result in extremely high licence fees as a result of the ongoing administrative components..
- C.5. The 2025-2110 MHz (2 GHz) band is presently utilized for Television Outside Broadcasting (TOB) services on a shared and non-exclusive basis, primarily for short applications like covering special events.¹¹ Currently, only a limited number of TOB licensees operate within the 2 GHz EESS band.
- C.6. By facilitating the introduction of innovative and low-impact EESS applications in the 2 GHz EESS band, while ensuring seamless coexistence with existing TOB services, the ACMA has the opportunity to significantly enhance the overall spectrum efficiency of the 2 GHz band.
- C.7. The Australian Radiofrequency Spectrum Plan (ARSP) includes an allocation in the band 2025-2110 MHz for Space Operations, Earth Exploration Satellite Service, Fixed, Mobile, and Space Research services on a primary basis.¹²
- C.8. As outlined in the Radiocommunications (Television Outside Broadcasting) (2010-2110 MHz and 2200-2300 MHz) Frequency Band Plan 2022, the 2010 to 2110 MHz frequency band may be used for the operation of an earth station outside of the Perth area.¹³
- C.9. The Radiocommunications Assignment and Licensing Instruction (RALI) FX 21 provides information on frequency coordination and licensing arrangements for television outside broadcast (TOB) services in the bands 1980-2110 MHz and 2170-2300 MHz. The information contained in RALI FX 21 reflects the ACMA’s current policy in relation to TOB services operation in the bands 1980-2110 MHz. The RALI FX 21 provides the basis of coordination arrangements in the bands 2010-2110 MHz between stations in the TOB service and Fixed Earth stations, fixed point-to-point links and stations operating under spectrum or apparatus licences in adjacent bands.¹⁴
- C.10. Fleet notes that under Radiocommunications Assignment and Licensing Instruction (RALI) MS03, the requested band is subject to Embargo 23. Embargo 23 sets forth that assignments for earth stations in the frequency range 2025–2110 MHz band, outside the Mingenew Earth Station Protection Zone, will be considered on a case-by-case basis.¹⁵
- C.11. As part of this consideration and with a view to providing an exemption from Embargo 23, the ACMA requires that the agreement of the co-channel TOB operator be sought. This serves to support the operation of TOB services in this

¹¹ See RALI FX 21: Television Outside Broadcasting Services. Australian Communications and Media Authority. Aug. 2022

¹² See Australian Radiofrequency Spectrum Plan 2021: Including General Information. Australian Communications and Media Authority. May 2023.

¹³ See Radiocommunications (Television Outside Broadcasting) (2010-2110 MHz and 2200-2300 MHz) Frequency Band Plan 2022. Federal Register of Legislation, F2023L01129. Australian Communications and Media Authority. Aug. 2023.

¹⁴ See RALI FX 21: Television Outside Broadcasting Services. Australian Communications and Media Authority. Aug. 2022

¹⁵ See RALI MS03: Spectrum Embargos. ACMA Spectrum Planning and Engineering Branch. Nov. 2023.

- band by restricting the areas in which earth stations are supported, in addition to potential planning activities associated with the siting of earth stations that are within propagation distance of high-density radiocommunications areas.¹⁶
- C.12. Fleet acknowledges the ACMA’s long-standing policy of not granting an exemption of Embargo 23 for mobile earth stations in the 2 GHz EESS band. However, Fleet is of the view that the low-impact and novel nature of their proposed operations and the national benefit of the EESS application present a strong basis for the ACMA to consider granting Fleet an exemption to Embargo 23.
- C.13. Low-power, itinerant EESS applications like Fleet’s in this band would be minor and would only involve the operation of low-power and low-duty cycle uplinks. As an example, these types of earth stations typically operate with a maximum EIRPsd of 7 dBW/125kHz and a maximum duty cycle of 0.5% in 24 hours. Moreover, noting that this type of EESS application typically requires sensors to be deployed at almost ground level, emissions from the EESS earth stations would experience significant path loss over some tens of kilometers due to the low power emissions.
- C.14. In the 2 GHz band replanning options paper, the ACMA sets forth that sharing the band under appropriate geographic separation arrangements would be acceptable if temporary access to the spectrum could be granted when major broadcasting events are held in regional areas.¹⁷ This is the exact type of compatibility that exists between itinerant, low-power EESS applications such as Fleet’s and the incumbent TOB operations in the 2 GHz band.
- C.15. Fleet Space believes there is scope for itinerant low-power geophysical sensors to operate under the existing regulations for the 2 GHz EESS band, through a Mobile Earth Station Apparatus Licence. This would require the ACMA to grant operators like Fleet an exemption from Embargo 23. Fleet is of the view that where an operator is able to present a strong business case for an exemption from Embargo 23 through successful coordination with incumbent Television Outside Broadcast operators and where there is sufficient national interest benefit of the application, the ACMA should adopt a more open and nuanced approach to support the licensing itinerant low power EESS applications in the 2025-2110 MHz band.

3. PRICING

1. Fleet Space suggests that the ACMA expand the low power discount framework to include space systems. Technologies like LoRaWAN, used in low power satellite communications, offer a cost-effective means of connecting remote and rural areas in Australia. Despite meeting the low power transmission limits, these technologies are currently excluded from discounts due to their classification as space services and restrictions on communications beyond 2 km. Consequently, they attract the full licence fees, despite posing no greater spectrum denial than their terrestrial low power counterparts. Indeed, whether the receiver is within 2 km of the transmitter has no bearing on the spectrum utilisation of the system. The ACMA should be encouraging long-range, low-power communication technology and their spectrum pricing should be updated accordingly.

¹⁶ See i.d.

¹⁷ See i.d.

2. Australia maintains one of the highest licence fee structures worldwide for satellite services.¹⁸ For instance, Earth stations incur 2-3 times higher tax fees compared to licences for fixed point-to-point, fixed point-to-multipoint, and television outside broadcast and do not necessarily pose larger spectrum denial to other users.¹⁹
3. Satellite technologies present a clear and cost-efficient solution to support Australia's efforts, particularly in achieving Target 17 of the Commonwealth's Closing the Gap Implementation Plan and enhancing connectivity in regional and rural areas. Further, small satellite technologies are well suited to supporting novel and innovative EESS applications such as ANT exploration technology used in critical mineral exploration. By extending the low-power discount eligibility to satellite services, the ACMA would eliminate the financial barriers for satellite operators looking to deploy commercial services in Australia. This move would align with Australia's space industry objectives to enhance connectivity in regional and rural areas.

4. International Engagement

A. WRC27 Agenda Item 1.5

- A.1. Fleet has no strong views on Agenda Item 1.5 and sees this as a low-priority agenda item. Unauthorised operations of non-GSO FSS and MSS earth stations in the earth-to-space direction is a matter for the affected administrations to deal with at the national level. Further, Fleet urges the ACMA to oppose any proposal that would require satellite operators to seek the explicit agreement of every administration that is included in the service area of an ITU filing for it to be accepted for filing by the BR.

B. WRC27 Agenda Item 1.12

- B.1. Fleet notes the lack of allocated and accessible MSS spectrum for small satellite operators. The implicit power and volume constraints of small satellites tend to limit their capabilities to operating in the 1-3 GHz range.
- B.2. Whilst Fleet is generally supportive of further MSS allocation within the 1-3 GHz range, Fleet is of the view that a clear and agreeable definition of a low-data rate MSS system is required before any substantive work can be progressed on this agenda item. Fleet will engage with the relevant Australian Radiocommunications Study Group (ARSG) in an effort to further this agenda item.

C. WRC27 Agenda Item 1.14

- C.1. Fleet recognises that there is increasing demand for new harmonized spectrum for MSS spectrum to satisfy the demand for a wide variety of applications covering both IoT/M2M, non-terrestrial network (NTN) MSS voice and data communication. Recognising the lack of MSS spectrum available in Australia for novel and innovative MSS applications, Fleet encourages the ACMA to engage with the relevant ARSG with a view to support such spectrum arrangements.

¹⁸ See Attachment E to ACMA, IFC 19-2016, Review of Taxation Arrangements for Satellite Services Consultation Paper (Aug. 2016).

¹⁹ See i.d.

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