Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
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Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment on Unmanned Aerial System Operations in the 960-1164 MHz and 5030-5091 MHz Bands, Pursuant to Section 374 of the FAA Reauthorization Act of 2018	))))))	GN Docket No. 19-356

To: The Commission

COMMENTS OF CTIA

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CTIA[1] respectfully submits these comments in response to the Public Notice issued by the Wireless Telecommunications Bureau ("WTB") and Office of Engineering and Technology ("OET") of the Federal Communications Commission ("Commission"), which seeks comment on how to integrate unmanned aerial system ("UAS") operations into the 960-1164 MHz ("L-Band") and 5030-5091 MHz bands ("C-Band"), as well as on additional actions the Commission might take "to promote the safe and robust use of licensed, commercial spectrum for UAS operations."[2]

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[1] CTIA – The Wireless Association® ("CTIA") (www.ctia.org) represents the U.S. wireless communications industry and the companies throughout the mobile ecosystem that enable Americans to lead a 21st Century connected life. The association's members include wireless carriers, device manufacturers, suppliers as well as apps and content companies. CTIA vigorously advocates at all levels of government for policies that foster continued wireless innovation and investment. The association also coordinates the industry's voluntary best practices, hosts educational events that promote the wireless industry and co-produces the industry's leading wireless tradeshow. CTIA was founded in 1984 and is based in Washington, D.C.

[2] *Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment on Unmanned Aerial System Operations in the 960-1164 MHz and 5030-5091 MHz Bands, Pursuant to Section 374 of the FAA Reauthorization Act of 2018*, Public Notice, GN Docket No. 19-356, DA 19-1207 (rel. Nov. 25, 2019) ("Public Notice"). Although the Public Notice refers to the 5030-5091 MHz spectrum band as the "C-Band," we note that there is an open Commission proceeding at this time related to different C-Band spectrum, from 3.7 – 4.2 GHz, which is not germane to these comments. *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, 33 FCC Rcd 6915 (2018).

I. INTRODUCTION AND SUMMARY.

CTIA has worked collaboratively with the Commission, the Federal Aviation Administration ("FAA"), the Department of Homeland Security ("DHS") and the National Aeronautics and Space Administration ("NASA") for years to explore how existing wireless networks, built and operated by the wireless industry, including CTIA members, can support and advance important UAS communications functions, including control links, remote identification and tracking[3], and payload communications.[4] CTIA members play many roles in the UAS ecosystem, as manufacturers of UAS, communications devices, network equipment, and their components; as providers of essential communications networks that support safe and secure UAS operations; and as operators of UAS and Low Altitude Authorization and Notification Capability ("LAANC"), the first step to UAS Traffic Management ("UTM").[5] CTIA and its members are committed to continue to play a key role in the transformative opportunities presented by UAS.

Safe UAS operations will depend on use of reliable, secure, and protected communications over licensed spectrum to support in-flight command and control systems as well as communication to payload applications. Because the L-Band and C-Band will not be

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[3] For additional discussion about the critical role of remote identification and tracking for safe and secure UAS operations, *see infra* at Section V.

[4] CTIA and its members have participated in the FAA's UAS Identification and Tracking Aviation Rulemaking Committee; the Commission's Technological Advisory Council ("TAC") working group for Communication Strategies for UAS; the UAS Integration Pilot Programs; the NASA UTM Pilot Program; and the DHS Critical Infrastructure Partnership Advisory Council ("CIPAC"). Recently, CTIA, in cooperation with the FAA, worked to establish 14 voluntary common data testing principles for CTIA member companies participating in the FAA UAS Integration Pilot Program. Such metrics could provide an invaluable starting point for any Commission review of wireless technology metrics.

[5] For more detail, *see Commercial Wireless Networks: The Essential Foundation of the Drone Industry*, CTIA (Nov. 13, 2017), https://api.ctia.org/wp-content/uploads/2017/11/Droner_WhitePaper_FINAL.pdf.

available for UAS operations for many years, and because these bands will not be capable of satisfying the needs of UAS operations at all altitudes, UAS will need to rely on other options for their operations. Networked cellular spectrum is ideally situated to meet those needs. It is widely available, reliable with certainty for quality of service, secure, interoperable, and positioned within a device ecosystem that is readily adaptable for UAS interfaces. This is, in no small part, due to the Commission's approach of enabling flexible use and allowing industry and standards bodies to develop interference protection criteria. As the Commission considers further action in the UAS space, CTIA urges the Commission to maintain flexible rules for spectrum management to support UAS operations and support prompt action on the promulgation of remote identification rules.

II. THE WIRELESS INDUSTRY PLAYS AN ESSENTIAL ROLE IN THE UAS ECOSYSTEM.

UAS hold tremendous promise across multiple industries, with one estimate valuing the emerging global market for business services at more than $127 billion.[6] There will be nearly two million small, low-altitude drones flying in U.S. airspace next year, according to the FAA,[7] and the number of UAS in national airspace is only expected to grow; hobbyist and commercial UAS sales are projected to top seven million in 2020.[8] Today, UAS efficiently and affordably transport life-saving blood products to remote, underdeveloped, or inaccessible areas, traveling

[6] Andrew Allen, *Drone market worth $127bn*, SUPPLY MANAGEMENT (May 30, 2019), https://www.cips.org/en/supply-management/news/2018/may/drone-market-worth-127bn/.

[7] FAA, FY 2019-2039 Forecasts, Unmanned Aircraft Systems, at 43-48, https://www.faa.gov/data_research/aviation/aerospace_forecasts/media/unmanned_aircraft_systems.pdf.

[8] FAA, FAA Releases 2016 to 2036 Aerospace Forecast, https://www.faa.gov/news/updates/?newsId=85227&cid=TW414.

40 miles in just fifteen minutes.[9] UAS are already a vital part of agriculture; as of 2017, one third of farmers reported that they relied on UAS in their activities, with that number expected to increase by more than 38 percent by 2025.[10] Drones are increasingly valuable for search and rescue, emergency response, crime scene and accident scene investigations and tactical situations; nearly one thousand state and local police, sheriff, fire and emergency services agencies in the U.S. acquired at least one UAS in 2018, representing an 82 percent increase from 2017.[11] Innovative use cases have developed in logistics, with Google's Project Wing and UPS Flight Forward obtaining FAA approval to deploy UAS-enabled delivery services.[12] UAS inspection of critical infrastructure, communications towers, energy sites, and oil rigs has saved both money—costing 80 percent less than traditional review—and lives.[13] All these UAS use

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[9] *See* Zipline, https://flyzipline.com/ (last accessed Dec. 16, 2019).

[10] *See* Ben Potter, *Poll: 33% of Farmers Flying Drones This Year*, AGWEB (Apr. 13, 2017), https://www.agweb.com/article/poll-33-of-farmers-flying-drones-this-year-NAA-ben-potter; *Agriculture Drones Market – Global Industry Analysis, Size, Share, Growth, Trends and Forecast 2018-2025*, MARKETWATCH (Sept. 10, 2018), https://www.marketwatch.com/press-release/agriculture-drones-market-global-industry-analysis-size-share-growth-trends-and-forecast-2018-2025-2018-09-10.

[11] Dan Gettinger, *Public Safety Drones: An Update*, Center for the Study of the Drone at Bard College (May 2018), https://dronecenter.bard.edu/projects/public-safety-drones-project/public-safety-drones-an-update/.

[12] *See* Press Release, UPS Pressroom (Feb. 2017), https://pressroom.ups.com/pressroom/ContentDetailsViewer.page?ConceptType=PressReleases&id=1487687844847-162; FAA Press Release, U.S. Transportation Secretary Elaine L. Chao Announces FAA Certification of UPS Flight Forward as an Air Carrier (Oct. 1, 2019); FAA Press Release, U.S. Transportation Secretary Elaine L. Chao Announces FAA Certification of Commercial Package Delivery (Apr. 23, 2019).

[13] *See* Wylie Wong, *Public Safety Agencies Deploy Drones to Plan for and Prevent Disasters*, STATETECH (Jul. 22, 2019), https://statetechmagazine.com/article/2019/07/public-safety-agencies-deploy-drones-plan-and-prevent-disasters; Juan Pedro Tomás, *The Role of Drones in Telecommunications Tower Inspections*, RCR WIRELESS (Feb. 21, 2017), https://www.rcrwireless.com/20170221/cell-tower-news/drones-telecommunications-tower-inspection-tag23-tag99; Mark Scott, *Energy Giants Turn to Drones and Sensors in New Embrace of the Digital World*, N.Y. TIMES (Nov. 3, 2016), https://www.nytimes.com/2016/11/03/business/energy-environment/energy-giants-turn-to-drones-and-sensors-in-new-embrace-of-the-digital-world.html?mcubz=1.

cases will need and depend upon robust and secure mobile communications infrastructure, and the only readily available communications infrastructure that can satisfy the near-term command and control needs of UAS is today's commercial wireless networks.

Keeping up with global competitors like China in the rapidly expanding UAS ecosystem will depend in large part on the ability to leverage existing communications resources so that UAS can be deployed safely and expeditiously. As many government and industry working groups have noted, licensed commercial wireless networks provide the coverage, authentication and security, quality of service, reliability and redundancy, latency and global interoperability required for safe UAS control links.[14] Moreover, the Commission's flexible-use policy for licensed mobile wireless spectrum lends itself well to supporting wireless services for a whole host of devices, including drones. In sum, commercial wireless networks offer key features needed for UAS operations and have played an ongoing role in the development of UAS throughout the country.

III. COMMERCIAL MOBILE SPECTRUM IS NEEDED AND BENEFICIAL FOR UAS OPERATIONS.

In light of the requirements of Section 374 of the FAA Reauthorization Act of 2018,[15] WTB and OET are seeking comment on whether UAS should be required or permitted to operate in the L-Band and C-Band, and on any technological, statutory, regulatory, and operational barriers to the use of these bands.[16] WTB and OET also seek comment on how various spectrum access methods and existing and planned infrastructure might overcome any technological or

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[14] *See e.g.*, RTCA, Drone Advisory Committee, Meeting #5 Report, at 67 (Nov. 8, 2017), https://www.rtca.org/sites/default/files/dac_ebook_final_novmtg_-_version_2.pdf ("DAC Report").

[15] FAA Reauthorization Act of 2018, PL 115-254, § 374, 132 Stat 3186 (2018) ("Section 374")

[16] *See* Public Notice at 1-2.

operational barriers to supporting UAS communications, and on how the Commission can "promote the safe and robust use of licensed, commercial spectrum for UAS operations."[17]

As explained in more detail below, commercial wireless networks are key to supporting the myriad devices and uses that consumers and businesses increasingly demand, and UAS operations should be no exception. Successful UAS operations will depend on the use of spectrum to communicate with ground systems and each other. Terrestrial wireless networks have been optimized to provide this type of communication. While the L-Band and C-Band will have a role to play in certain types of UAS operations and functions, it is important for the Commission to acknowledge the benefits of using flexible, reliable, and secure licensed commercial wireless spectrum in the UAS ecosystem.

A. The L-Band and C-Band Should be Permitted, but Not Required, to Support UAS Operations.

As envisioned by the International Telecommunication Union, L-Band and C-Band spectrum will play a role in providing command and control communications for safe and secure UAS operations, but commercial mobile spectrum remains critical to meet growing UAS communications needs in this emerging sector. Although spectrum in the L-Band and C-Band is already identified and allocated for Aeronautical Mobile Route (R) Service and control links for UAS, additional spectrum and infrastructure can be utilized to fully support these operations.[18] As a preliminary matter, there are no technical and service rules to enable use of either the L-

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[17] *Id*. at 2. The Public Notice's request for information on how to enable licensed commercial wireless technology is consistent with Section 374, which stated that the multi-agency report "does not prohibit or delay use of any licensed spectrum" to satisfy UAS control links and other functions.

[18] *See* Comments of CTIA, *374_AJW_2018 Reauthorization White Paper FAA Work Overview* (filed Nov. 18, 2019), https://www.ctia.org/positions/documents/ctia-comments-on-faa-sec-374-uas-spectrum-overview.

Band or the C-Band for UAS control links today, nor are there any pending rulemakings to adopt service and technical rules for the L-Band and C-Band.[19] Such rules would require Commission action and would take years to develop, potentially stifling the growth of the still-nascent UAS industry at a time when UAS already are operating in local airspace. Moreover, even after such rules are promulgated, and networks leveraging the L-Band and C-Band are built and operational, these bands are unlikely to offer reliable or robust solutions for control links for all UAS at all altitudes.

As the FAA has noted, L-Band capacity is already heavily utilized for aeronautical radio navigation services ("ARNS") and by aircraft surveillance and military communications systems.[20] Aviation systems in this band include navigation aids, surveillance systems, and collision avoidance systems required for safe manned-aircraft operations.[21] As a result, use of the L-Band for UAS operations would be location and altitude dependent, with most operations concentrated at low altitudes to protect incumbent aviation systems from harmful interference.[22]

Although the C-Band does not have incumbent services that need protection, it is also an incomplete solution for UAS control and communication links. Its propagation suffers severe losses in non-line of sight conditions, such as low-altitude UAS flying below local clutter of buildings and trees.[23] Thus, it would only be suited to support operations at medium altitudes, where aircraft could fly mostly in radio line-of-sight of network towers. In short, the limitations

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[19] Aerospace Industries Association filed a petition for rulemaking with the FCC for the 5030-5091 MHz band, but the FCC has not yet issued a Notice of Proposed Rulemaking. *AIA Petition to Adopt Service Rules for Unmanned Aircraft Systems Command and Control in the 5030- 5091 MHz Band*, Petition for Rulemaking, RM-11798 (filed Feb. 8, 2018).

[20] FAA Section 374 Overview, Stakeholder Collaboration Version, at 1 (Oct. 18, 2019).

[21] *See id.* at 2.

[22] *See id*.

[23] *See id.* at 7.

of the L-Band and C-Band prevent both bands from serving as a complete and viable solution for UAS operations at all altitudes.

The UAS industry and its federal partners cannot wait years for adoption of L-Band and C-Band service and technical rules or for deployment of operational systems and infrastructure for these bands according to an as-yet unproven economic use case. Use of spectrum other than the L-Band and C-Band will thus be vital, and the spectrum available from commercial wireless providers can be part of a timely and necessary solution.

B. Commercial Wireless Spectrum Is Available, Reliable, Secure, and Flexible and Should Be Relied Upon for Use for UAS Operations.

The benefits for UAS to use networked cellular to support UAS, particularly at low altitude, are well understood. Existing commercial 4G LTE networks can already support UAS control links, and further optimization after wide-scale testing will only expand those capabilities. Multi-billion dollar investments in 5G wireless technology will bring denser, higher throughput coverage at lower latency to enable safe and secure UAS deployments on a larger scale,[24] providing UAS with an even faster and more reliable communications platform for UAS control links and other functions. In contrast to a dedicated UAS network with unclear proof of concept, standardization path, and investment return prospects, our nation's commercial wireless networks provide a safe, reliable, and efficient method of providing robust communications resources for UAS communications.[25] Moreover, using commercial wireless technology to support UAS communications brings myriad other benefits, including the potential for tracking

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[24] *See* Qualcomm, *Drones + 5G: The Sky's the Limit* (Nov. 14, 2016), https://www.qualcomm.com/news/onq/2016/11/14/drones-5g-skys-limit.

[25] Even if the Commission were to decide to bring LTE wireless technologies into the C-Band, doing so would still require the agency to engage in a rulemaking process.

UAS using wireless technology; the harmonization of commercial wireless bands, which will assist in trans-border operations; and the evolving nature of 5G wireless technology, which will provide even better coverage and dynamic data traffic management in the future.[26] Licensed spectrum, in short, can promise security, reliability, and quality of service. Other spectrum options, such as unlicensed bands and even some aviation-protected bands, cannot provide these important attributes.

Coverage. UAS operations rely on ubiquitous coverage and cellular networks are already deployed nationwide—covering more than 99 percent of the U.S. population[27]—and can support advanced UAS operations, including beyond visual line-of-sight flights and flights over people.

Reliability and Redundancy. The reliability of wireless technology will also minimize and mitigate the risk of a "lost link" with a ground station or UTM. Wireless networks include overlapping, adjacent cell sites that minimize the possibility of UAS connection issues.[28] As the FAA Drone Advisory Committee observed:

> Cellular networks in the U.S. are engineered for massive volumes and cover more than 99% of Americans at approximately 300 million people. 56% of U.S. population resides inside mode C veil. High-risk areas are populated and located in proximity to transport infrastructure (*e.g.*, airports). Cellular networks are designed to

[26] *See* Presentation of Nikolai Vassiliev, Chief of the Terrestrial Services Department, International Telecommunications Union, *Potential Spectrum and Telecom Technologies for Small UAS*, ICAO's Unmanned Aircraft Systems Industry Symposium (Sept. 22-23, 2017), https://www.icao.int/Meetings/UAS2017/Documents/Nikolai%20Vassiliev_Background_Day%201.pdf ("ICAO Presentation").

[27] *See Communications Marketplace Report*, Report, 33 FCC Rcd 12558, at Fig. A-29 (2018).

[28] For additional discussion of how wireless networks address lost link and handoff issues, *see* Qualcomm, *LTE Unmanned Aircraft Systems, Trial Report* (May 12, 2017), https://www.qualcomm.com/media/documents/files/lte-unmanned-aircraft-systems-trial-report.pdf.

> serve these populated areas with high capacity and high reliability/coverage.[29]

Moreover, the redundancy is already built in to the wireless networks. Unlike aviation bands, which have no back-up or redundancy, wireless networks can leverage multiple bands to provide seamless service, including for UAS control links. Finally, even where certain UAS operators may choose satellite or aviation frequency bands—such as for large UAS operations that transport cargo and passengers or for high-altitude operations—multiple licensed commercial wireless bands or multiple providers can provide redundant connectivity, particularly during low-altitude safety-critical flight phases such as takeoff and landing.

Security. Licensed wireless networks also provide the security needed to support critical use cases, including UAS operations. The wireless industry has a long history of working to protect consumers, networks, and technology from cyber threats.[30] Networked cellular is

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[29] DAC Report at 67. The DAC Report highlighted additional reasons why using commercial wireless networks are the right approach for UAS operations: "(1) Many [beyond visual line-of-sight] and Urban/Suburban operations will occur within areas with high LTE coverage; (2) Operational requirement for communications vary per use case including which phases of flight require coverage, latency, etc.; (3) Timing: Cellular LTE networks are deployed today and operating with high level of reliability and security; (4) LTE is based on 3GPP world standard; (5) Multimode/multiband chipsets for cellular devices support connectivity options over 2G/3G/4G networks as well as other radio technologies such as Wi-Fi; (6) LTE UAS link performance in terms of latency, reliability, coverage, data rate, UAS density, positioning accuracy, etc. being demonstrated and validated through field trials and simulation; (7) UAS device volume and bandwidth need is low compared to capacity of LTE networks; (8) LTE services could also be used for UAS payload communications (*e.g.*, sensor control, sensor data downlink) and using the same technology for CNPC and non-CNPC UAS communications could provide cost savings; (9) Cost of entry is low for connectivity and equipment (~$15 LTE Cat 1 Module) given leverage from the massive scale of cellular; (10) UAS equipage for LTE + other radio connectivity (2G, 3G, Wi-Fi) is extremely low in weight (4-10g on average, not including battery or antenna(s)); (11) Ability to uniquely identify each UAS; (12) Ability to handle redundant communication paths, *e.g.*, SMS plus data, or two concurrent data sessions with different APNs (Access Point Names). Can also utilize multiple providers to improve coverage; and (13) Provides latest evolution for spectrally efficient simultaneous service to multiple devices."

[30] The communications and aviation sectors are among the 16 sectors included in the National Institute for Standards & Technology ("NIST") Critical Framework for Cybersecurity (the "NIST Framework"), a longstanding public-private partnership focused on innovation, collaboration, sharing information related to cybersecurity, and responding to evolving cybersecurity threats at the network, device, and application

equipped with a variety of security approaches, including authentication technologies that validate and authorize users. And, while today's 4G wireless networks offer the most advanced security features to date, 5G networks will further improve upon them through IMSI encryption, home network control, increased network virtualization, and device-specific updates.[31]

***Interoperability*.** Moreover, global adoption of harmonized standards for the wireless industry can be leveraged for the benefit of UAS and UTM, providing the consistency and interoperability needed to allow vendors and manufacturers to take advantage of economies of scale, thus ensuring a vibrant, global UAS ecosystem. The wireless industry's global standards enable interoperability which will allow for global harmonization and consistency needed across countries and borders. Finally, wireless devices and infrastructure are readily available for use in the ecosystem, as smartphones and tablets on the market, and network infrastructure equipment, already interface both with UAS and networked cellular.[32]

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layers. For additional discussion on how the wireless industry applies cybersecurity protections and the NIST Framework in the Internet of Things, *see* Comments of CTIA, Considerations for Managing Internet of Things (IoT) Cybersecurity and Privacy Risks (Draft NISTR 8228) (Oct. 24, 2018), https://api.ctia.org/wp-content/uploads/2019/11/CTIA-Comments-re-NISTIR-8228.pdf.

[31] *See* John Marinho, *What's New in 5G Security? A Brief Explainer*, CTIA BLOG (June 12, 2019), https://www.ctia.org/news/whats-new-in-5g-security-a-brief-explainer.

[32] *See, e.g.*, UAS Identification and Tracking (UAS ID) Aviation Rulemaking Committee (ARC), ARC Recommendations Final Report (Sept. 30, 2017), https://www.faa.gov/regulations_policies/rulemaking/committees/documents/media/UAS%20ID%20ARC%20Final%20Report%20with%20Appendices.pdf ("UAS ID ARC Report"); DAC Report at 67; ICAO Presentation, *supra*, note 26.

IV. MOBILE NETWORK OPERATORS AND STANDARDS BODIES ARE WELL-POSITIONED TO ADDRESS INTERFERENCE ISSUES.

A. Wireless Industry Standards Bodies and Operators Have a Successful Track Record of Developing Interference Protection Criteria.

The Commission's approach to UAS operations should be consistent with its approach to spectrum allocation and service rules, which value flexibility and neutrality as to users and technologies. U.S. wireless operators, unlike those in many other countries, have been permitted to deploy any mobile or fixed service (including aeronautical mobile services such as UAS) so long as the use is (a) consistent with the spectrum allocation for the band and (b) compliant with the underlying technical service rules for the band (such as power, out-of-band emission, and border field strength limits).[33] Under this approach, the U.S. wireless industry—with the support of standards bodies—has seamlessly transitioned from 2G to 3G to 4G, and now to 5G services, without the need for additional rule making processes. Use of commercial spectrum for UAS should not require any change to this wildly successful approach of allowing the industry to develop and protect each entity from interference while maintaining U.S. leadership globally in the deployment of UAS.

B. Maintaining Flexible Rules Governing UAS Spectrum Will Allow for Continued Innovation.

In the Public Notice, WTB and OET ask about the potential for interference from UAS use of commercial spectrum to adjacent spectrum bands and geographic markets, particularly in

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[33] Flexible-use spectrum policy suggests a non-restrictive approach to spectrum use for the subject band, allowing the spectrum user to choose the services and technologies to be deployed subject to spectrum allocations and service rules. The Commission has moved to flexible-use licensing because it ensures the radio spectrum is used efficiently and intensively—an important public interest goal—and can "ensure the spectrum is put to its most beneficial use, allow licensees to respond to consumer demand for new services, and maximize the probability of success for new services." *See Transforming the 2.5 GHz Band*, Notice of Proposed Rulemaking, 33 FCC Rcd 4687 ¶ 10 (2018) (internal cites omitted).

circumstances where high densities of UAS are involved, and whether any such risk could be mitigated. WTB and OET also seek guidance on the deployment scenarios under consideration by wireless service providers and equipment manufacturers.[34]

WTB and OET correctly note that the 3rd Generation Partnership Project ("3GPP") has ongoing studies for UAS.[35] However, while the Public Notice asserts that these studies indicate that the use of flexible-use spectrum to support UAS may increase the risk of interference, especially where high densities of unmanned aircraft are involved,[36] it does not address the fact that the 3GPP studies (a) establish standards that will allow LTE technologies to satisfy key performance indicators ("KPIs") and (b) discuss a variety of mitigation techniques already embedded in the existing standards. For example, for downlink interference, the study found that FD-MIMO, directional antennas on UAS, and receive antenna beamforming on the UAS all were shown to limit the interference impact even with high density of UAS deployed.[37] Each of these features are already part of the existing 3GPP standard (and there were other standards-

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[34] *See* Public Notice at 2.

[35] *See* Alliance for Telecommunications Industry Solutions ("ATIS"), *Support of UAV Communications in 3GPP Cellular Standards* (Oct. 2018), https://access.atis.org/apps/group_public/download.php/42855/ATIS-I-0000069.pdf ("ATIS Report"). 3GPP Release 15 was approved in June 2018 and includes enhancements to LTE to support UAVs as well as introduction of the first version of 5G NR. Release 16 was started in September 2017 and is targeted for approval of stage 3 in December 2019. The timetable for Release 17 is not yet set but will likely be 12-18 months later than Release 16. *See also* 3rd Generation Partnership Project, 3GPP TR 36.777 at 19, Enhanced LTE support for aerial vehicles ("Release 15"), https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3231. Release 15 work focused on height reporting when a drone crosses a network-configured reference altitude, interference detection and mitigation, UAS-dedicated radio measurement reporting, signaling of flight path information from drone to LTE network, location information reporting including a drone's horizontal and vertical velocity, and subscription-based aerial drone remote identification and authorization.

[36] *See* Public Notice at 2.

[37] *See* Release 15 at 19.

based features that were also shown to mitigate interference). Similarly, for uplink interference, the study found these same features (FD-MIMO, directional antennas, receive antenna beamforming) could mitigate the interference impact from UAS.[38] 3GPP also suggested other power control mechanisms that could be added to the specification to alleviate interference even with high density of UAS operations.

3GPP and other industry standards bodies, in cooperation with wireless operators, have established practices and procedures to determine requirements to protect commercial wireless operations. For example, nearly all commercial mobile spectrum bands also have provisions for fixed services—and there has not been a need for the Commission to develop and promulgate specific technical rules to govern the interference environment between fixed and mobile services outside of the standard limits on power, out-of-band emissions, and border field strength limits. Current field strength limits at any location on the geographical border of a licensee's service area do not specify any height requirement for the 600 MHz, 700 MHz, AWS-1, AWS-3, or WCS bands,[39] the PCS band,[40] or the Cellular band.[41] Instead of specific requirements, parties are required to meet these limits unless the affected licensee of the neighboring market area agrees to a different field strength[42]—which could be used by wireless operators to reach agreement on UAS operations. There is thus no need for the Commission (or the TAC) to test or measure UAS interference to mobile networks.

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[38] *See id*. at 20.

[39] *See* 47 C.F.R. § 27.55.

[40] *See* 47 C.F.R. § 24.236.

[41] *See* 47 C.F.R. § 22.983.

[42] *See* 47 C.F.R. §§ 22.983(a), 24.236, 27.55(a).

Mobile network operators have every incentive to ensure that their networks operate optimally. Allowing the commercial mobile industry to work collaboratively, without government intervention into the process, would be the most effective and efficient approach to the expeditious development of UAS procedures. Through development of standards to manage out-of-band emissions and power levels and collaboration with other neighboring wireless operators on other system parameters, mobile network operators can ensure that UAS operations will not cause harmful interference to wireless networks. As has been true for other technological changes that have occurred in wireless technology over the past 25 years, these efforts can result in UAS deployments that will not adversely affect other wireless providers (or other Commission licensee in adjacent spectrum bands). This approach is consistent with the highly successful flexible-use paradigm adopted by the Commission for the past two decades and allows for continued innovation by the industry in response to the ever-changing UAS environment.

C. The 3GPP Standard Prepares Wireless Cellular Networks To Support UAS Communication Needs.

In a recent report regarding 3GPP Release 16, ATIS identified a broad array of use cases.[43] These include initial authorization to operate an Unmanned Aeronautical Vehicle ("UAV"); live data acquisition by UTM; data acquisition from the UTM by law enforcement; enforcement of no-fly zones; enforcement of separation between UAVs operating in close proximity; local broadcast of UAS identity; differentiation between UAVs with integral cellular capabilities and conventional mobile phones attached to UAVs; cloud-based non-line of sight UAV operation; and UAV-based remote inspection of infrastructure.[44]

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[43] *See* ATIS Report at 5-6.

[44] *See id*.

As a result of these identified use cases, 3GPP identified a number of key requirements, such as ensuring that UAVs and UAV controllers can send identification and personal information to UTM at initial authorization; the UTM can restrict authorization to operate a UAV; UAVs and UAV controllers can send location continuously to UTM and this may be augmented by network-provided location data; when operating beyond line of sight, UAVS must also support the broadcast of identity; law enforcement can query UTM for location and identity information; the network can differentiate different types of UAV, such as UAV with integral cellular capabilities and UAVs without integral cellular capabilities (*e.g.*, a UAV carrying a regular ground base smartphone); and the 3GPP system can help to enforce the authorization for an in-flight UAV to operate based on UAV subscription information or under the instructions from UTM.[45] These and other requirements in Release 16 and Release 17 will help prepare mobile cellular networks to meet the requirements of increased UAV traffic and to provide improved technical means to help enforce safe operation.

V. IMMEDIATE ACTION ON REMOTE IDENTIFICATION SHOULD BE A GOVERNMENT PRIORITY FOR UAS.

WTB and OET also seek comment on any additional actions needed to promote the safe and robust use of licensed, commercial spectrum for UAS.[46] The FAA just released a Notice of Proposed Rulemaking for remote identification of UAS ("Remote ID").[47] Remote ID—*i.e.*, the ability of the UAS to transmit identifying information to other parties on the ground while operating in the national airspace—is crucial to facilitating more advanced UAS operations and

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[45] *See id*. at 5-6.

[46] *See* Public Notice at 2.

[47] *See Remote Identification of Unmanned Aircraft Systems, Federal Aviation Administration*, Notice of Proposed Rulemaking, FAA Docket No. FAA-2019-110, RIN 2120-AL31 (rel. Dec. 26, 2019).

the eventual UTM system. This effort is in response to recommendations developed by the UAS Identification and Tracking ("UAS-ID") Aviation Rulemaking Committee to establish remote identification of UAS. The UAS-ID recommendations included commercial wireless (or "networked cellular") in its discussion of appropriate remote ID technologies.[48] The Commission's efforts to seek comment on spectrum requirements for UAS should not deter expeditious action on remote identification rules.

VI. CONCLUSION.

CTIA commends WTB and OET on their work to ensure that innovative UAS will be able to conduct safe and secure operations in the national airspace. As WTB and OET consider the C-Band and L-Band, they should note that L-Band and C-Band spectrum are unlikely to be available to support UAS control links for many years and, even then, will not be a complete solution for all UAS at all altitudes. Licensed commercial wireless cellular networks, on the other hand, are positioned today to provide the coverage, reliability, quality of service,

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[48] *See* UAS ID ARC Report at 2-3. For Congressional directives to the FCC for swift progress toward a remote ID rule, *see e.g.*, Letter from Reps. Peter A. DeFazio, Sam Graves, Rick Larsen, and Garret Graves, U.S. House of Representatives, Committee on Transportation and Infrastructure, to Hon. Elaine L. Chao, Secretary, Department of Transportation; Hon. Daniel K. Elwell, Acting Administrator, FAA; Hon. Russell Wright, Acting Director, Office of Management and Budget, July 2, 2019, *available at* https://transportation.house.gov/imo/media/doc/2019-07-02%20LTR%20DOT%20Remote%20ID%20Rule%20Delay.pdf (expressing concerns about delaying remote ID); Letter from Sens. John Thune and Edward J. Markey, U.S. Senate, to Hon. Steven Dickson, Administrator, FAA, Sept. 12, 2019, *available at* https://www.thune.senate.gov/public/_cache/files/8a1133eb-1dc9-4b4f-9b5d-bcfc8ea0cbad/1B0670BD6E861C404E7A3655401E57FC.09.12.19-uas-remoteid-letter.pdf (urging swift publication of a FAA Notice of Proposed Rulemaking on remote ID); New Entrants in the National Airspace: Policy, Technology, and Security Issues for Congress: Hearing Before the Committee on Commerce, Science, and Transportation, 116 Cong. (2019) (Statement of Sen. Wicker), *available at* https://www.commerce.senate.gov/2019/5/new-entrants-in-the-national-airspace-policy-technology-and-security-issues-for-congress# ("The Remote ID rulemaking will be an important milestone because many operational, privacy, and security concerns can be addressed by readily identifying each object in the sky and its operator, and we certainly hope so. Perhaps we will hear an update on the agency's rulemaking at this hearing.").

redundancy, security, and interoperability to support safe UAS control and communication links. Use of commercial spectrum for UAS should not lead the Commission to reconsider its successful approach of permitting industry and standards bodies to develop interference protection criteria for flexible use spectrum—nor should it interfere with forthcoming FAA action on Remote ID rules.

Respectfully submitted,

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