

**Department of Commerce**

**National Telecommunications and Information Administration**

**Docket Number: 230308-0068**

**Development of a National Spectrum Strategy**

**COMMENTS OF AURA NETWORK SYSTEMS, INC.**

**I. INTRODUCTION**

AURA Network Systems, Inc. (AURA) respectfully responds to the National Telecommunications and Information Administration’s (NTIA) recent request for comment (*Request for Comment*) on the development and implementation of a National Spectrum Strategy for the United States.<sup>1</sup> AURA is designing and building an FAA-compliant, secure, and reliable data and voice command-and-control (C2) communications network that will enable crewed aircraft and uncrewed aircraft (UA) to safely navigate through national airspace, including beyond visual line of sight (BVLOS), using licensed aviation-designated spectrum.<sup>2</sup>

Today, the uncrewed aircraft system (UAS) industry drives innovation, creates jobs, and fosters competition. As the Federal Communications Commission (FCC) recently recognized,

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<sup>1</sup> *Development of a National Spectrum Strategy*, National Telecommunications and Information Administration, 88 Fed. Reg. 16824 (Mar. 16, 2023), Request for Comment (*Request for Comment*).

<sup>2</sup> AURA has petitioned the Federal Communications Commission (FCC) to effectuate permanent rule changes to allow use of 450 MHz spectrum for UAS control and non-payload communications (CNPC). See AURA Network Systems OpCo, LLC and A2G Communications LLC, Petition for Rulemaking, RM-11912 (filed Feb. 16, 2021) (RM-11912). Additionally, AURA is participating in the FCC’s current rulemaking proceeding regarding the use of 5030-5091 MHz for UAS CNPC. See *Spectrum Rules and Policies for the Operation of Unmanned Aircraft Systems*, WT Docket No. 22-323, Petition of AIA for Rulemaking to Adopt Service Rules for Unmanned Aircraft Systems Command and Control in the 5030-5091 MHz Band, RM 11798 (RM 11798, terminated), Notice of Proposed Rulemaking, FCC 22-101 (rel. Jan. 4, 2023) (*FCC C-band NPRM*), Comments of AURA Network Systems (filed Mar. 9, 2023) (AURA C-band Comments).

the benefits of UAS include the “[long-range] inspection of towers, pipelines, and buildings, aerial photography, mapping, surveillance, deliveries . . . [of] critical medical supplies, and support for emergency operations like . . . post-hurricane recovery[] and wildfire response.”<sup>3</sup> As the industry continues to evolve, it will provide myriad additional benefits. For example, in conjunction with developments in clean-fuel aircraft and electric vertical takeoff and landing technologies, advanced air mobility (AAM) can “be faster, cheaper[,] and produce fewer CO<sub>2</sub> emissions than conventional aircraft, enabling same-day shipping over very long distances” and improve businesses’ logistics.<sup>4</sup> Similarly, urban air mobility (UAM) – which will involve “highly automated aircraft . . . operat[ing] and transport[ing] passengers or cargo at lower altitudes within urban and suburban areas,”<sup>5</sup> including electric air taxis<sup>6</sup> – will revolutionize the movement of people and goods in traffic-plagued regions.<sup>7</sup>

Spectrum is a critical component necessary to unleash these benefits. AURA is focused on ensuring the availability of spectrum for safe and large-scale UA operation, including for C2 and other safety-of-life systems. AURA recommends that as NTIA creates a National Spectrum Strategy, it examine the needs of the UAS industry and incorporate policies to ensure that

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<sup>3</sup> *Wireless Telecommunications Bureau Seeks to Refresh the Record on Unmanned Aircraft Systems Use of the 5 GHz Band*, Public Notice, 36 FCC Rcd 12706, at 1 (WTB 2021); *see also* Comments of DRONERESPONDERS Public Safety Alliance, RM-11912, at 2 (filed Sept. 24, 2021) (Public safety can use UAS to “conduct natural disaster assessments, assist with law enforcement and firefighting, and help in search-and-rescue missions.”); Comments of Florida Power and Light, WP Docket No. 07-100, at 4 (filed Nov. 29, 2021) (FPL 4.9 GHz Comments) (explaining how FPL uses UAS to identify the cause of an outage and restore power to consumers quickly while keeping employees safe.); Letter from James Grimsley, Executive Director – Advanced Technology Initiatives, Choctaw Nation of Oklahoma, to Marlene Dortch, Secretary, FCC, RM-11912, at 1-2 (filed Dec. 7, 2022) (discussing the benefits of UAS in tribal lands, which are typically unserved or underserved).

<sup>4</sup> Mike Butcher, *Autonomous Cargo Drone Airline Dronamics Reveals It’s Raised \$40M, pre-Series A*, TechCrunch (Feb. 17, 2023), <https://tcrn.ch/3SY3tPV>.

<sup>5</sup> *Urban Air Mobility and Advanced Air Mobility*, FAA, <https://bit.ly/3uOlfSB> (last updated June 1, 2022).

<sup>6</sup> Comments of Wisk Aero, RM-11798, at 1 (filed Oct. 12, 2021).

<sup>7</sup> *See generally id.*

spectrum availability is an enabler of the industry's growth. This includes both making new spectrum bands available as necessary and creating streamlined processes to repurpose existing spectrum bands to higher and better use cases, including new aeronautical or UAS uses.

In addition, more broadly, AURA recommends a renewed cross-governmental focus on spectrum coordination with and between government and industry to secure U.S. leadership through sound domestic policy, effective international coordination, and strong engagement in key industry bodies.

## **II. THE ANTICIPATED GROWTH OF UAS WILL REQUIRE DEDICATED SPECTRUM – A SIGNIFICANT PORTION OF WHICH WILL NEED TO BE EXCLUSIVELY LICENSED**

### **A. The Immediate Need for Dedicated UAS Spectrum is Clear**

The UAS industry is growing rapidly. Indeed, the total UAS market is expected to grow to more than \$63 billion by 2025 – up from \$5 billion in 2018.<sup>8</sup> The AAM market is expected to increase to \$115 billion by 2035, creating 280,000+ jobs.<sup>9</sup>

Much of this growth will come from larger scale commercial and industrial UAS applications. To date, most UAS operations are hyper local within line of sight of the aircraft operator. These flights rely on unlicensed spectrum for the necessary control links between the ground station (handheld controller in most cases) and the aircraft. This next generation of significant growth – which will establish UAS as a major new industry in the United States –

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<sup>8</sup> Committee on Science, Space and Technology, H.R. 9376, *The National Drone and Advanced Air Mobility Act* (introduced Dec. 2, 2022), Fact Sheet. [https://republicans-science.house.gov/\\_cache/files/e/f/ef4f6494-8300-469b-abb2-3bce289c1a6b/DA61B86054A40CFE8B82137894190049.fact-sheet--national-drone-and-advanced-air-mobility-initiative-act.pdf](https://republicans-science.house.gov/_cache/files/e/f/ef4f6494-8300-469b-abb2-3bce289c1a6b/DA61B86054A40CFE8B82137894190049.fact-sheet--national-drone-and-advanced-air-mobility-initiative-act.pdf).

<sup>9</sup> *Id.*

will require dedicated spectrum that is necessary to create large and sophisticated UAS communications platforms that are required to enable more complex flights including BVLOS.

Importantly, such dedicated spectrum does not exist today. The FCC recently noted that “[c]urrently no spectrum is licensed in the United States exclusively for UAS communications, and operators have generally relied on unlicensed operations or experimental licenses.”<sup>10</sup> The FCC’s proposal in its C-band NPRM to utilize the entire 5030-5091 MHz band for control and non-payload communications (CNPC) will be very helpful, and it’s just the start. The UAS industry needs a comprehensive approach to address its spectrum requirements incorporated within the National Spectrum Strategy. AURA suggests that as it develops its National Spectrum Strategy, NTIA consider the short- and long-term spectrum needs of UAS – both in internationally allocated spectrum and spectrum allocated domestically for such purpose. Within its consideration, AURA suggests NTIA also examine ways to accelerate spectrum access for UAS purposes, especially in circumstances where such access is both the blocker and the catalyst for advanced operations.<sup>11</sup>

### **B. The Use-case Benefits for Exclusively Licensed Spectrum are Clear**

Some of the use cases anticipated for UAS, such as cargo transport and utility and other infrastructure reliability, will involve BVLOS flights over long distances. The Edison Electric Institute recently noted, for example, that “[b]eyond radio-line of sight operations are essential to the electric industry’s use case for its large drone operations and surveillance of facilities across electric company service territories.”<sup>12</sup> And a NASA study predicted that uncrewed air cargo

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<sup>10</sup> *FCC C-band NPRM* at ¶ 4.

<sup>11</sup> For example, dedicated CNPC spectrum is necessary for BVLOS operations, and the C-band was allocated specifically for this purpose at WRC-12, ten years prior to the initiation of the proceeding to establish the service, licensing, and technical rules for the band.

<sup>12</sup> *FCC C-band NPRM*, Comments of Edison Electric Institute (filed Mar. 9, 2023) at 7.

deliveries could begin as early as 2025 and entirely replace crewed cargo deliveries over the next 35 years.<sup>13</sup> For such use cases, a UAS C2 network will need to cover large geographic areas, including the entire United States. It will also need to be highly resilient, with low latency. Importantly, such large-scale specialized networks – each of which could require hundreds of transmit sites on the ground – will need to be built from the ground up. To AURA’s knowledge, it is the only entity currently building a UAS C2 network using licensed, aviation-dedicated spectrum.

These UAS communications networks are fundamentally full-stack communications platforms, custom built to support sophisticated, safety-of-life reliant, and aviation-compliant UAS operations.<sup>14</sup> This includes the ground network, new base station technologies, aircraft transceivers, software stacks, frequency management systems, and customer platforms to assign channels to specific flights. As AURA explained to the FCC, “[t]his level of investment requires predictable access to spectrum to raise sufficient capital and provide the quality-of-service levels necessary for end users to fly UA over large and localized geographic areas.”<sup>15</sup> For this reason, a significant portion of the spectrum dedicated to UAS operations, including for CNPC, will need to be exclusively licensed. Absent the certainty of exclusive licenses, entities are unlikely to be able to raise the capital necessary to make the large investments required of a large-scale UAS CNPC network.

Furthermore, licensed spectrum is necessary to enable longer range BVLOS connections between aircraft and ground stations. Licensed spectrum has the benefit of allowing higher

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<sup>13</sup> NASA study at 13; <https://ntrs.nasa.gov/api/citations/20190007020/downloads/20190007020.pdf>.

<sup>14</sup> AURA supports the use of flexible use spectrum to support UAS operations if it’s shown that such operations do not cause interference. In practice, given the natural design of mobile wireless network architecture, such services will likely be focused on aircraft flying below 400 feet.

<sup>15</sup> AURA C-band Comments at 13.

power transmitters than unlicensed bands. The combination of licensed spectrum and exclusivity will create the necessary incentive for continued and future investment in these new technologies and networks.

AURA therefore urges NTIA, as it develops its National Spectrum Strategy, to prioritize making spectrum available on an exclusively licensed basis for UAS C2 in order to unlock the benefits of UAS and foster the transformation of transportation in this country. In particular, AURA urges NTIA to consider both the short- and long-term needs of the UAS industry given the nascent state of this sector, its importance in maintaining global competitiveness, and the traditional lead time in making spectrum available for new uses.

Finally, while AURA urges NTIA to focus on exclusive use spectrum for UAS C2, it also believes there is an important need for some amount of licensed shared spectrum to enable other kinds of use cases and to create low-barrier access to spectrum for new innovations over time. As such, AURA also suggests that NTIA consider opportunities for shared licensed spectrum for UAS operations in discrete spectrum bands.

### **III. THE ADMINISTRATION SHOULD ESTABLISH A COHESIVE STRATEGY FOR COORDINATING SPECTRUM ACROSS AGENCIES AND ACROSS INDUSTRY SECTORS TO MAXIMIZE U.S. COMPETITIVENESS AND REGULATORY EFFICIENCY**

Because spectrum is a limited resource with many competing users and use cases – both existing and nascent – spectrum planning by design necessitates centralized planning. A cohesive and clear plan across government helps it coordinate with international bodies, helps industries and government users plan, helps facilitate new innovations, and helps maximize U.S. competitiveness.

In its *Request for Comment*, NTIA notes that it is collaborating with the FCC on the long-term National Spectrum Strategy.<sup>16</sup> AURA suggests that national spectrum planning requires continuous and focused high-level coordination among multiple federal entities – with the FCC and NTIA leading – that are affected by, and can help inform, spectrum decisions. This intra-agency coordination is critical as spectrum decisions often impact the jurisdiction and mission of other federal agencies besides NTIA and the FCC – both in the short and long term.

The *FCC C-band NPRM* is a good example of how the repurposing or assignment of spectrum pursuant to a national spectrum policy can affect other federal entities. The FCC specifically notes that the NPRM “implicates the jurisdiction and concerns of multiple federal agencies.”<sup>17</sup> Indeed, AURA advocated in its comments in that proceeding that under the aegis of NTIA, the FCC establish a formalized executive-level group with the FAA to examine UA spectrum issues on an ongoing basis.<sup>18</sup> Such narrowly focused multi-agency executive-level groups could be leveraged to address short term decisions affecting government and industry stakeholders.

A broader, multi-agency executive-level group could be formed to consider spectrum decisions of a longer-term nature. Only by understanding the spectrum needs of different government and industry stakeholders and their constituents can NTIA fashion a truly effective National Spectrum Strategy. Such intra-governmental communication can also help avoid problems that might arise after spectrum decisions that might negatively impact another governmental agency, or its stakeholders, have already been made.

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<sup>16</sup> See *Request for Comment* at 9.

<sup>17</sup> *FCC C-band NPRM* at ¶ 3.

<sup>18</sup> AURA C-band Comments at 5.

The National Spectrum Strategy itself will be an important catalyst for this kind of collaboration. While stakeholders from agencies with spectrum equities do coordinate under the IRAC and other groups, the lack of a top-down mandate results in stove-piped missions, objectives, and outcomes. With a clear mandate and clear leadership roles, these coordinating bodies can thrive, can maximize the efficient allocation and assignment of spectrum, and can help ensure U.S. leadership in spectrum.

This is critical both for domestic policy and international coordination. Government stakeholders need to perpetuate a clear view and strategy that cuts across government and industry, and carry that into international bodies, both governmental and non-governmental. Without a clear strategy, leadership, and relentless engagement, our policy infrastructure will continue to be focused on narrow issues, specific agency concerns, and discrete industry asks, rather than a holistic and fulsome approach aimed at long term leadership and execution.

#### **IV. THE GOVERNMENT SHOULD FACILITATE WIDE-SCALE INNOVATION IN SPECTRUM MANAGEMENT TECHNIQUES ACROSS ALL POTENTIAL USER GROUPS**

Spectrum is naturally constrained when the demand exceeds supply. However, modern technologies can help better utilize spectrum by authorizing more users dynamically and in tighter radio frequency environments. These technologies include databases, sensor networks, and software defined radios. Indeed, the FCC has utilized such systems in several frequency bands – *e.g.*, the Citizens Broadband Radio Service<sup>19</sup> – and has proposed utilizing such systems

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<sup>19</sup> *FCC C-band NPRM* at ¶ 27 (“In addition, the Commission has successfully relied on automated dynamic frequency management systems in other bands, including the Spectrum Access System (SAS) that was adopted in the 3.55-3.7 GHz band (3.5 GHz band) to coordinate spectrum access to the Citizens Broadband Radio Service (CBRS)...”).

in others – *e.g.*, 5030-5091 MHz.<sup>20</sup> Any and all of these technologies could be useful in a given band, but they are not universally necessary, applicable or even as yet fully developed.<sup>21</sup> A National Spectrum Strategy should encourage the development of these technologies and create a framework for a) making a determination for when they are necessary in a band; b) creating a common set of requirements; and c) creating streamlined access approval processes.

AURA notes, however, the phrase “dynamic spectrum management” can mean different things. In some bands, it can mean allowing multiple types of licensees offering differing services to use the same spectrum. In others, it can mean maximizing the use of spectrum by multiple end-users who will utilize the spectrum for varying use cases. For example, in the *FCC C-band NPRM*, the FCC proposed that spectrum management systems be employed to enable multiple users in the same spectrum band while still ensuring strict safety requirement needed for safety-of-life operations. Because of the extremely high reliability required for CNPC for certain sophisticated UAS use cases envisioned in the C-band, allowing multiple UAS users in the band – but not different categories of licensed or unlicensed services – is logical and important. A National Spectrum Policy should flexibly allow for the right spectrum management techniques in different frequency bands.

Finally, consistent with promoting efficient spectrum utilization through innovative spectrum management techniques, the National Spectrum Strategy should clearly articulate a policy framework that the FCC can implement – and should envision seeking Congressional action as necessary – to address receiver performance for bands that are newly licensed, that are

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<sup>20</sup> *Id.* at ¶ 26 (“To address the complexities involved in coordinating shared interference-protected access to the 5030-5091 MHz band, we propose that access to the band be managed by one or more dynamic frequency management systems (DFMS).”).

<sup>21</sup> For example, AURA believes that while cognitive radios are a potentially powerful tool to enable spectrum sharing, their use still requires extensive analysis and testing.

repurposed, and that are already licensed. As the Commission explained in its *Receiver Performance NOI*, after highlighting the 20 years of academic, government, and industry analysis of the issue and potential solutions:

Receiver performance also can significantly affect the Commission’s ability to introduce new services in the same or nearby frequencies. In particular, receivers without sufficient interference immunity performance can diminish opportunities for innovative spectrum uses that drive economic growth, competition, security, and innovation. They can put constraints on what is possible in the evolving wireless world.<sup>22</sup>

As the supply of spectrum becomes ever-more constrained, and as the government and industry develop new methods of more intensive spectrum coordination, receiver performance will continue to be a blocker towards more efficient spectrum allocations, spectrum assignments, and new wireless applications. The National Spectrum Strategy should recognize this constraint and propose actionable solutions to address this significant issue.

**V. THE NATIONAL SPECTRUM STRATEGY SHOULD INCLUDE POLICIES THAT SUPPORT THE RAPID REPURPOSING OF PREVIOUSLY LICENSED SPECTRUM**

Technology changes occur very quickly and, in order to be effective, the National Spectrum Strategy needs to enable rapid changes to spectrum use. This is particularly true when spectrum repurposing does not include removing or protecting incumbent operations – for example, where licensees seek to offer innovative, new services in their licensed spectrum and such new services will equitably serve the public interest without introducing new sources of interference.

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<sup>22</sup> *Promoting Efficient Use of Spectrum through Improved Receiver Interference Immunity Performance*, ET Docket No. 22-137, Notice of Inquiry, FCC 22-29 (rel. Apr. 21, 2022) (*Receiver Performance NOI*).

Specifically, where licensees seek to offer innovative new services using their existing licensed spectrum, the National Spectrum Strategy should promote a timeline that will authorize licensees to offer such new services on a permanent basis within 18-24 months of the licensee's formal request to do so. This quick but reasonable timeline will allow licensees to move quickly to invest the resources needed to develop the infrastructure and other technologies required to offer new services in their existing spectrum.

Pursuant to the National Spectrum Strategy, AURA suggests the FCC could collaborate with NTIA to identify a process by which proponents can seek such modifications, including requiring all the technical, policy, and legal arguments necessary to allow the FCC and NTIA (as necessary) to decide whether to move forward with a formal proceeding. Without a doubt, it should be the proponent's responsibility to prove that its modifications are value-generating without creating inefficient externalities. They must clearly and objectively address issues like the potential for interference, public interest equities, the impact on competition, and other areas the FCC and NTIA deem appropriate.

AURA understands and respects the reality that the FCC and NTIA are resource constrained and may only be able to address so many issues at a time. However, with a clear, articulated policy that puts all the onus on the proponents, they can streamline their work as they consider new repurposing requests.

This clear process can stimulate new investment in new technologies and services. The FCC and NTIA have made significant strides in efficiently and rapidly assigning spectrum for commercial and federal uses over the last three decades. Some of these assignments will persist perpetually, as the spectrum is continually put to use to serve the public interest. But some assignments and some services become technologically or economically obsolete over time. The

government should encourage private sector innovators to develop new technologies and new services that can better exploit spectrum that is otherwise underutilized by creating a clear process that provides predictability about the timeline for government action that either authorizes such new uses or prohibits them.

## **VI. CONCLUSION**

AURA supports NTIA's efforts to create a robust, effective, and comprehensive National Spectrum Strategy. This effort is critical to establishing a set of goals and organizing principles for an all-of-government approach to spectrum management that maximizes the efficient use of spectrum and facilitates U.S. global competitiveness. Within the National Spectrum Strategy, as discussed herein, AURA urges NTIA to consider the needs of the UAS industry in the near and long term, and to establish principles for the robust inter-agency engagement necessary to successfully implement the National Spectrum Strategy.

Respectfully submitted,

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