

**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
WASHINGTON, DC 20554**

In the Matter of	)	
	)	
Petition to Adopt Service Rules of Unmanned	)	RM-11798
Aircraft Systems (“UAS”) Command and	)	
Control in the 5030-5091 MHz Band	)	

**REPLY COMMENTS OF ROCKWELL COLLINS, INC.**

The record in this proceeding confirms that the Commission should grant the Aerospace Industries Association’s (“AIA’s”) Petition for Rulemaking.<sup>1</sup> As several parties have explained, establishing technical and operational rules for Unmanned Aerial System (“UAS”) Control and Non-Payload Communications (“CNPC”) in the 5030-5091 MHz band is critical to enabling industry to use this band to support continued UAS development.<sup>2</sup> Rockwell Collins, Inc. (“Rockwell Collins”) adds its support to those urging the Commission to take swift action on the AIA Petition to help realize this important goal.

**I. INTRODUCTION AND SUMMARY**

Rockwell Collins is an industry leader in providing communications and aviation electronics solutions, including high-integrity radio solutions, to commercial aviation customers,

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<sup>1</sup> Petition to Adopt Service Rules for Unmanned Aircraft Systems (“UAS”) Command and Control in the 5030-5091 MHz Band of Aerospace Industries Association, RM-11798 (filed Feb. 8, 2018) (“Petition”).

<sup>2</sup> *See generally* Comments of the Boeing Company, RM-11798 (filed May 29, 2018) (“Boeing Comments”); Comments of Raytheon Company, RM-11798 (filed May 29, 2018) (“Raytheon Comments”); Comments of Lockheed Martin Corporation, RM-11798 (filed May 29, 2018) (“Lockheed Martin Comments”); Comments of Elefante Group, Inc., RM-11798 (filed May 29, 2018) (“Elefante Group Comments”); Comments of Integrity Communications Solutions Inc., RM-11798 (filed May 29, 2018).

the U.S. Department of Defense (“DoD”), and other U.S. Government agencies. Based on its strong expertise in commercial manned aviation and unmanned DoD operations, Rockwell Collins has been integrally involved in development of standards for the safe operations and integration of UAS into the national airspace system (“NAS”). Specifically, Rockwell Collins participated in developing the Minimum Operational Performance Standards (“MOPS”) at RTCA Special Committee (“SC”)-223 for UAS CNPC links in the 5030-5091 MHz band for command and control (“C2”), which informed the subsequent Federal Aviation Administration (“FAA”) Technical Standards Order (“TSO”) for CNPC.<sup>3</sup> In addition, Rockwell Collins participated with National Aeronautics and Space Administration (“NASA”) in experimental UAS operations of DO-362-compatible C2 links (hereinafter “C2 links”) in the Midwest.<sup>4</sup>

Rockwell Collins fully agrees with the comments filed by Boeing, Lockheed Martin, and Raytheon, which call for prompt action on the AIA Petition.<sup>5</sup> By moving swiftly towards a rulemaking, the Commission will spur economic investment of the private sector in UAS

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<sup>3</sup> RTCA, Inc., *Command and Control Data Link Minimum Operational Performance Standards (Terrestrial)* at i, RTCA-DO-362 (Sept. 22, 2016) (“Command and Control Data Link Minimum Operational Performance Standards”); U.S. Department of Transportation, Federal Aviation Administration, *Unmanned Aircraft System Control and Non-Payload Communications Terrestrial Link System Radios*, Technical Standard Order TSO-C213 (effective Mar. 9, 2018) (“TSO-C213”).

<sup>4</sup> See John Croft, *Link Margin: NASA, Rockwell Collins prove out high capacity UAS Data Link*, Aviation Week and Space Technology, July 14, 2014, at 60; John Croft, *Doing More with Less: NASA, Rockwell Collins optimize limited UAV Spectrum*, Aviation Week and Space Technology, July 1, 2013, at 34; Charlotte Adams, *Integrating UAS in the NAS*, Avionics Magazine, Aug. 1, 2013, at 15, available at <http://www.aviationtoday.com/2013/08/01/integrating-uas-in-the-nas/>.

<sup>5</sup> See Lockheed Martin Comments at 5; Raytheon Comments at 2; Boeing Comments at 3.

technologies.<sup>6</sup> In contrast, while CTIA and the Small UAV Coalition do not advocate quick action on the 5030-5091 MHz band, their reasons for delay are either unrelated to the AIA Petition specifically, or pose issues that are ripe for resolution within the context of a rulemaking proceeding to adopt service rules for the band.

## **II. USE OF THE 5030-5091 MHz BAND FOR UAS OPERATIONS HAS BEEN IN DEVELOPMENT SINCE 2004 AND HAS BEEN FULLY VETTED.**

Initiating a rulemaking for UAS CNPC operations in the 5030-5091 MHz band is both timely and necessary. The study and allocation of the 5030-5091 MHz band have been vetted through a series of milestones beginning in 2004. RTCA, Inc.—the organization that develops consensus-based industry standards for aviation operations—established SC-203 in 2004, after the FAA identified C2 spectrum for study for UAS purposes. The work at SC-203 led to discussion at the World Radio Conference (“WRC”)-07, and agreement to add protected spectrum for UAS C2 to the WRC-12 agenda. As the Commission is aware, the U.S. advocated for the allocation of 5030-5091 MHz for Aeronautical Mobile (Route) Service (“AM(R)S”) on a primary basis for line of sight control links for UAS at WRC-12, which recognized the need for “high integrity communication links” for UAS operations.<sup>7</sup> WRC-12 adopted the international

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<sup>6</sup> A study by the Association for Unmanned Vehicle Systems International (“AUVSI”) showed that in the first three years of UAS integration into the NAS, more than 70,000 jobs will be created in the United States, with an economic impact of more than \$13.6 billion. This benefit will grow through 2025, with more than 100,000 jobs created and an economic impact of \$82 billion. See AUVSI, *The Economic Impact of Unmanned Aircraft Systems Integration in the United States* 2-3 (Mar. 2013), available at [https://higherlogicdownload.s3.amazonaws.com/AUVSI/958c920a-7f9b-4ad2-9807-f9a4e95d1ef1/UploadedImages/New\\_Economic%20Report%202013%20Full.pdf](https://higherlogicdownload.s3.amazonaws.com/AUVSI/958c920a-7f9b-4ad2-9807-f9a4e95d1ef1/UploadedImages/New_Economic%20Report%202013%20Full.pdf).

<sup>7</sup> *United States of America Proposals for the Work of the Conference*, Agenda Item 1.3, as attached to Letter from Lawrence E. Strickling, Assistant Secretary for Communication and Information, U.S. Department of Commerce, and Julius Genachowski, Chairman, Federal Communications Commission, to the Honorable Phillip L. Verveer, Coordinator, International Communications and Information Policy, U.S. Department of State (Feb. 17, 2011) available at [https://transition.fcc.gov/bureaus/ib/wrc-12/us/1st\\_Tranche.pdf](https://transition.fcc.gov/bureaus/ib/wrc-12/us/1st_Tranche.pdf).

AM(R)S allocation, which led to the Commission’s Notice of Proposed Rulemaking in 2015 and subsequent Order adopting the allocation on March 29, 2017.<sup>8</sup>

Standards development continued with the creation of RTCA SC-228 to develop the MOPS operational standards for CNPC on behalf of the FAA.<sup>9</sup> Importantly, the MOPS, which include radio performance characteristics, do not require a certain waveform to be used, and simply provide minimum standards for interference masks and criteria for bandwidth usage. Thus, the MOPS are consistent with CTIA’s call to establish “technology-neutral” rules for the band.<sup>10</sup> The MOPS and the FAA’s subsequent development of a TSO for CNPC demonstrate the maturity of and consensus around the future use of the band.<sup>11</sup> In order to move forward, however, the industry now requires the FCC to establish service rules for the band.

### **III. THE COMMISSION SHOULD PROPOSE RULES RESTRICTING THE 5030-5091 MHz BAND TO SAFETY-OF-LIFE OPERATIONS.**

CTIA maintains that the Commission should not limit the 5030-5091 MHz band to safety-of-life operations.<sup>12</sup> However, government and industry actions to date regarding the band’s allocation reflect broad agreement that safety-of-life restrictions are required for these aviation uses to reduce the likelihood of harmful interference, which could pose a significant

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<sup>8</sup> See *Amendment of Parts 1, 2, 15, 25, 27, 74, 78, 80, 87, 90, 97, and 101 of the Commission’s Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2007) (WRC-07), Other Allocation Issues, and Related Rule Updates*, Report and Order, Order, and Notice of Proposed Rulemaking, 30 FCC Rcd. 4183, 4262 ¶ 225 (2015); *Amendment of Parts 1, 2, 15, 25, 27, 74, 78, 80, 87, 90, 97, and 101 of the Commission’s Rules Regarding Implementation of the Final Acts of the World Radiocommunication Conference (Geneva, 2012) (WRC-12), Other Allocation Issues, and Related Rule Updates*, Report and Order, 32 FCC Rcd. 2703, 2718 ¶ 41 (2017).

<sup>9</sup> See Command and Control Data Link Minimum Operational Performance Standards.

<sup>10</sup> See Comments of CTIA at i, RM-11798 (filed May 29, 2018) (“CTIA Comments”).

<sup>11</sup> See TSO-C312.

<sup>12</sup> CTIA Comments at i-ii, 12.

safety risk to the public. This public safety consideration cannot be overstated: The 5030-5091 MHz band will support operation of UAS platforms that will likely be certified by the FAA based on their size and operational characteristics, which will include flying over populated areas and into and out of controlled airport environments. The FAA requires certificates for aircraft that must meet certain airworthiness requirements so they do not pose a risk to public safety. In contrast, FAA certification is not required by certain “small” UAS platforms operating under Part 107 of the FAA rules.<sup>13</sup>

As discussed above, the 5030-5091 MHz band is allocated to the Aeronautical Mobile (Route) Service.<sup>14</sup> The FCC’s rules define AM(R)S as “an aeronautical mobile service reserved for communications relating to safety and regularity of flight, primarily along national or international civil air routes.”<sup>15</sup> If the Commission does not set aside this spectrum for CNPC C2 UAS operations, UAS operations in this band could experience interference that could cause a risk to public safety if they lost link and crashed. Examples of safety-of-life use cases that are contemplated for CNPC UAS C2 operations include optionally piloted or single-pilot cargo and commercial operations, U.S. military training operations, border surveillance, and oil and gas inspection.

These safety-of-life concerns are reflected in the FAA’s separate regulatory regimes for UAS platforms over 55 pounds that require aircraft certification, versus “small” UAS platforms regulated under Part 107<sup>16</sup> that pose less of a risk to human life if a crash occurs. CTIA argues that “networked cellular solutions” can offer capabilities similar to CNPC C2 radios in the 5030-

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<sup>13</sup> See 14 C.F.R. § 107.

<sup>14</sup> See 47 C.F.R. § 2.106.

<sup>15</sup> *Id.* § 87.5.

<sup>16</sup> See 14 C.F.R. §§ 107.1-107.205.

5091 MHz band.<sup>17</sup> But however suitable a commercial cellular network may be for certain types of small UAS platforms that would not pose a great danger to public and operational safety, these networks cannot guarantee non-interference in the same manner that a dedicated, well-studied set of federally-managed frequencies would.

Given these important safety considerations, Rockwell Collins encourages the Commission to propose rules contemplating the use of a frequency assignment manager and dynamic frequency assignment, as proposed by the Petition and supported by commenters.<sup>18</sup> The Small UAV Coalition contends that a frequency assignment management scheme requires further analysis.<sup>19</sup> However, this is exactly why the Commission should initiate a rulemaking proceeding. Continued engagement across the public and private sectors will be an important input for developing a final rule that addresses frequency management assignments,<sup>20</sup> but the required analysis and stakeholder input can only be accomplished through an FCC notice and comment rulemaking addressing how such a management scheme should work.

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<sup>17</sup> See CTIA Comments at 7-8.

<sup>18</sup> See Petition at iii, 13-16; Lockheed Martin Comments at 3-4; Boeing Comments at 11-12.

<sup>19</sup> See Comments of Small UAV Coalition at 4-5, RM-11798 (filed May 25, 2018).

<sup>20</sup> See e.g., NASA, *Unmanned Aircraft Systems Integration in the National Airspace System Cooperative Agreement Notice (CAN) Systems Integration and Operationalization Development and Demonstration 4*, Solicitation No. 80AFRC18N0001, OMB Control No. 2700-092 (rel. May 2, 2018), *available at* <https://nspires.nasaprs.com/external/viewrepositorydocument/cmdocumentid=624673/solicitationId=%7B672AA332-1F1E-48D4-E2B4-B89793D5E30D%7D/viewSolicitationDocument=1/Cooperative%20Agreement%20Notice.pdf> (the purpose of the NASA Systems Integration and Operationalization Development and Demonstration is to “demonstrate UAS operations in the NAS by leveraging integrated Detect and Avoid, C2, and other state-of-the-art UAS technologies on one or more unmanned aircraft; advance the state-of-the-art for UAS technologies; ensure relevant UAS-NAS Project research transitions into UAS stakeholder community; and accelerate the certification basis for UAS.”). See also Petition at 4 n.12 (describing experimental licenses that the Commission has granted with respect to this band that have enabled safe use of the spectrum and technological development).

**IV. THE PETITION DOES NOT SEEK TO LIMIT THE TYPES OF UAS OPERATORS IN THE 5030-5091 BAND, NOR DOES IT PROPOSE THAT UAS OPERATIONS BE LIMITED TO THIS BAND.**

CTIA contends that “it could be inferred that AIA intends that all UAS command and control communications should be conducted using the 5030-5091 MHz band.”<sup>21</sup> This inference would be misplaced. Indeed, as Lockheed Martin explains, use of the C-band for C2 operations “will be self-limiting.”<sup>22</sup> This is the case because of “the specific equipage requirements for unmanned aircraft,” as well as the fact “that many flights utilizing C-band C2 links are likely to be conducted by operators seeking to access higher altitudes, flying aircraft capable of longer endurance missions.”<sup>23</sup> Based on the standards development to date, this self-limiting use case for the 5030-5091 MHz band is necessary and appropriate to protect safety of life.

CTIA further speculates that the Petition seeks to limit *all* UAS operations to the 5030-5091 band.<sup>24</sup> Rockwell Collins disagrees with this assessment. As CTIA recognizes, many companies—including Rockwell Collins—are exploring different spectrum bands to support UAS operations.<sup>25</sup> Depending on the use case, several spectrum bands may be appropriate for UAS operations, and the operating rules for those bands may appear in several different FCC rule parts. Thus, granting the AIA petition would not result in “regulating all UAS under Part

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<sup>21</sup> CTIA Comments at 7.

<sup>22</sup> Lockheed Martin Comments at 3. *See also* Elefante Group Comments at 2 (citing the need for “highly reliable ... C2 links free from disruption”).

<sup>23</sup> *Id.*

<sup>24</sup> CTIA Comments at 7.

<sup>25</sup> *Id.* at 6-7 and n.13.

87.”<sup>26</sup> However, it is critical that the carefully studied 5030-5091 MHz band be set aside for safety-of-life UAS operations using CNPC.

## V. CONCLUSION

After nearly 14 years of the development of technical standards for CNPC C2 links and the completion of necessary milestones by the Commission, FAA, international bodies, and the private sector, it is imperative that the Commission complete the next logical step and expeditiously move forward to initiate a proceeding to adopt service rules for the 5030-5091 MHz band.

Respectfully submitted,

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<sup>26</sup> See *id.* at 16.



## CERTIFICATE OF SERVICE

I hereby certify that, on this 13<sup>th</sup> day of June 2018, I caused a true and correct copy of the foregoing Reply Comments of Rockwell Collins, Inc. to be served via first class mail, postage paid, upon:

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