



## FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 0, 1, 2, 87, 88 and 95

[WT Docket No. 22-323; FCC 24-91; FR ID 255475]

### Spectrum Rules and Policies for the Operation of Unmanned Aircraft Systems

**AGENCY:** Federal Communications Commission.

**ACTION:** Final rule.

**SUMMARY:** In this document, the Federal Communications Commission (FCC or Commission) enables Uncrewed Aircraft System (UAS) operators to access dedicated spectrum for control-related communications. Specifically, this document adopts service rules under new rule part 88 that provide operators the ability to obtain direct frequency assignments in a portion of the 5030-5091 MHz band for non-networked operation. Under these rules, one or more dynamic frequency management systems (DFMSs) will manage and coordinate access to the spectrum and enable its safe and efficient use, by providing requesting operators with temporary frequency assignments to support UAS control link communications with a level of reliability suitable for operations in controlled airspace and other safety-critical circumstances. To address concerns regarding the impact of these aeronautical operations on adjacent services, this document locates these operations, for now, in the central part of the band, with substantial separation from the bands adjacent to the 5030-5091 MHz band.

**DATES:** The rules are effective [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER], except for §§ 88.27, 88.31, 88.33, 88.35, 88.111, 88.113, 88.115, 88.135, 88.137, and 88.141, which are delayed. The Federal Communications Commission will publish a document in the *Federal Register* announcing the effective date. The incorporation by reference of material listed in § 88.117 is approved by the Director of the Federal Register as of [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

**FOR FURTHER INFORMATION CONTACT:** For additional information on this proceeding, contact Peter Trachtenberg of the Mobility Division, Wireless Telecommunications Bureau, at Peter.Trachtenberg@fcc.gov or (202) 418-7369. For information regarding the Paperwork Reduction Act of 1995 (PRA) information collection requirements contained in this document, contact Cathy Williams, Office of Managing Director, at (202) 418-2918 or Cathy.Williams@fcc.gov.

**SUPPLEMENTARY INFORMATION:** This is a summary of the Commission's *Report and Order* in WT Docket No. 22-323; FCC 24-91, adopted on August 21, 2024, and released on August 29, 2024. The full text of this document is available for public inspection online at <https://docs.fcc.gov/public/attachments/FCC-24-91A1.pdf>. To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an e-mail to [fcc504@fcc.gov](mailto:fcc504@fcc.gov) or call the Consumer & Governmental Affairs Bureau at 202-418-0530 (voice), 202-418-0432 (TTY).

### **Synopsis:**

Achieving the extraordinary potential of UAS technology will require integrating UAS operations into the National Airspace System (NAS), including in the controlled airspace in which commercial passenger flights operate and in circumstances with heightened risk, such as flights involving large aircraft or carrying passengers or flights beyond line of sight of the remote pilot. To ensure that these flights are sufficiently safe for routine operation, highly reliable wireless two-way communications for flight control and telemetry are required. In a Notice of Proposed Rulemaking, WT Docket No. 22-323, FCC 22-101, 88 FR 7910 (February 7, 2023) (*UAS NPRM*), the Commission proposed rules for the 5030-5091 MHz band to help address these spectrum needs.

### **Background**

In the *Report and Order*, the Commission now takes an initial step to enable UAS operators to access dedicated spectrum in the 5030-5091 MHz band for control-related

communications with the required reliability. Specifically, the Commission adopts new UAS service rules under new rule part 88 that provide operators the ability to obtain direct frequency assignments in a portion of the 5030-5091 MHz band for non-networked operation. The Commission finds wide support for enabling early, direct access to a portion of the band for protected assignments under DFMS coordination, and anticipates that such access will facilitate the safe integration of UAS operations into the NAS so that the United States can realize the enormous potential benefits that UAS operations can provide.

## **Discussion**

### **A. Non-Networked Access (NNA) Service Rules**

#### **1. Definitions and Designation of Sub-band for NNA Operations**

In the *UAS NPRM*, the Commission proposed to adopt certain band and service rule definitions, including definitions for unmanned aircraft systems and unmanned aircraft, as well as other terms, including non-networked access operations, and control and non-payload communications. Noting consistency with FAA definitions, the Commission proposed to define an unmanned aircraft system as “an unmanned aircraft (UA) and its associated elements (including communication links and the components that control the UA) that are required for the safe and efficient operation of the UA in the airspace of the United States,” and an unmanned aircraft as “an aircraft operated without the possibility of direct human intervention from within or on the aircraft.” The Commission adopts these definitions as proposed, but finds it in the public interest to revise the terminology. It finds that the term “uncrewed” is more inclusive and could better reflect future use cases for the spectrum, such as uncrewed passenger flights, and thus find that it is appropriate to substitute “uncrewed” in place of “unmanned.” Specifically, it adopts the use of “uncrewed aircraft system” and “uncrewed aircraft” in place of “unmanned aircraft system” and “unmanned aircraft,” respectively.

In the *UAS NPRM*, the Commission also identified two broad use cases for determining the appropriate band plan and service rules: non-networked operations, or those communications

occurring within radio line of sight, and network-supported services, which rely on network infrastructure to go beyond radio line of sight of the operator. The Commission proposed establishing the term Non-Networked Access (NNA) to “indicate spectrum or licenses (e.g., NNA blocks) that would be governed by service rules appropriate to support non-networked communications.” The *UAS NPRM* further proposed the use of “Network-Supported Services” (NSS) to indicate that the relevant spectrum or licenses would be governed by service rules appropriate to support the provision of networked-based services. The Commission also proposed to use NNA and NSS in the rules to designate the spectrum allocated for non-networked and network-supported use cases, respectively. In the *Report and Order*, the Commission adopts the NNA and NSS terms as discussed above.

*NNA Block Configuration.* Although the Commission finds that it is premature to establish a permanent band plan in light of continuing developments and evolution of the industry, there is sufficient record support and basis to establish rules to allow early access for non-networked, direct link operations without compromising any future action the Commission may take with respect to UAS operations in the 5030-5091 MHz band. The Commission thus establishes a temporary placement for NNA operation—with a permanent band plan, including final locations for NNA and NSS as well as potential provisions for opportunistic use by NNA users or NSS licensees, to be resolved in the future.

Specifically, the Commission allots 10 megahertz for near-term NNA access. The Commission finds that, until it makes a determination regarding a permanent band plan, it is appropriate to locate the 10 megahertz NNA block at 5040-5050 MHz. As discussed below, the Commission is adopting an interim access mechanism (IAM) to enable NNA entities to begin operations in the band during the interim period before a DFMS is operational. Because it will be challenging to effectively manage and coordinate operator use of the NNA spectrum during this period, the Commission will allow access to additional spectrum beyond the 10 megahertz to facilitate the management and deconfliction of NNA operations during this period. Accordingly,

during the IAM period, NNA entities may access to 20 megahertz of the band, at 5040-5060 MHz. The Wireless Telecommunications Bureau (WTB) will announce the dates operators may begin to access the NNA block using the IAM process, as well as the date on which a DFMS becomes operational and the IAM period ends. Once a DFMS becomes operational, the NNA operations will be limited to the 10 megahertz at 5040-5050 MHz.

## **2. Scope of Permissible Uses**

The Commission limits the scope of NNA communications in the 5030-5091 MHz band to Control and Non-payload Communications (CNPC), defined as any transmission that is sent between the UA component and the UAS ground station of the UAS and that supports the safety or regularity of the UA's flight. This approach is in the public interest and is well-supported by the record.

*Mobile and fixed NNA operations.* The Commission provides that the use of both fixed and mobile ground stations for NNA operations is permissible so long as they are not in motion during operation and operations are limited to the location associated with the specific frequency assignment. The adopted NNA rules do not set specific limits as to the use of multiple fixed stations to achieve a single NNA operation, and multi-station operations, whether involving multiple connected or non-connected stations, are permitted by the NNA rules. Thus, UAS operators might choose to access NNA spectrum using limited infrastructure deployment, such as a string of ground stations deployed over a particular and frequently used flight path.

## **3. Licensing Stations by Rule**

The Commission adopts licensing-by-rule for both NNA ground and aircraft stations, pursuant to section 307(e) of the Act, as amended. *See* 47 U.S.C. 307(e). Section 307(e)(1) limits the Commission's authority to adopt a license-by-rule approach to certain specific categories of service, including the "citizens band radio service." Section 307(e)(3) in turn provides that "citizens band radio service" shall have the meaning given to it by the Commission by rule. As defined in the Commission's rules, the "citizens band radio service" encompasses

“any radio service or other specific classification of radio stations used primarily for wireless telecommunications for which the FCC has determined that it serves the public interest, convenience, and necessity to authorize by rule the operation of radio stations in that service or class, without individual licenses, pursuant to 47 U.S.C. 307(e)(1).” The Commission finds that licensing NNA stations by rule will serve the public interest, convenience, and necessity.

Under the license-by-rule framework, to obtain Commission authorization to use the NNA spectrum, NNA users must use certified, Commission-approved NNA stations, and comply with the applicable NNA rules, but need not obtain individual spectrum licenses from the Commission. Because a license-by-rule approach will serve the public interest, convenience, and necessity, NNA stations are appropriately classified as part of the citizens band radio services. This classification reflects only the Commission’s determination that the NNA service should be licensed by rule as the Commission has used that construct pursuant to its section 307(e)(1) authority, and not a determination that it should be more generally be regulated in similar fashion to other services that are classified under the citizens band radio services category, such as those in part 95 or part 96 of the Commission’s rules.

#### **4. Eligibility**

Given the limited discussion of the issues raised by foreign ownership of stations in a license-by-rule service, the Commission is guided by the approach that it took in the 3.5 GHz Citizens Broadband Radio Service (CBRS) rules to eligibility for users of CBRS General Authorized Access (GAA) stations, which, like NNA stations, are licensed by rule. In relevant part, section 96.5 of the Commission’s rules establishes that any entity, other than those precluded by section 310, that otherwise meets the technical, financial, character, and citizenship qualifications that the Commission may require in accordance with such Act, is eligible to be a General Authorized Access (GAA) user. The Commission finds that it will serve the public interest to adopt a similar eligibility rule for NNA users.

#### **5. Creation of a New Part 88**

The Commission will include UAS-related rules for the 5030-5091 MHz band in a single rule part and place such rules in a new part 88, rather than placing the new rules in part 87. Establishing a new part 88 will promote “clarity and ease of reference” regarding the rules applicable to UAS operations in the 5030-5091 MHz band. The Commission also makes the new part 88 subject to rules under part 1, subpart F of the Commission’s rules governing “Wireless Radio Service” applications and proceedings.

## **6. Technical Requirements**

*The RTCA DO-362A Standard.* The Commission finds it in the public interest to incorporate by reference the standard RTCA, Command and Control (C2) Data Link Minimum Operational Performance Standards (MOPS) (Terrestrial), RTCA-DO-362A (2020) (RTCA DO-362A) and to adopt certain technical requirements in our new UAS rules based on this standard. Taking this approach is appropriate at this time, particularly given today’s incremental steps toward facilitating UAS operations, which provides a path in the 5030-5091 MHz band for authorization of NNA equipment and operations through shared use, while deferring for further consideration and study potential approaches to exclusive licensing for NSS operations.

The Commission will incorporate by reference into its technical rules the specific sections of the RTCA DO-362A standard applicable to transmitter output power, emissions bandwidth, out-of-band emission limits, emission mask and time division duplexing. To provide stakeholders increased flexibility, and in lieu of mandating use of specific emission designators, an applicant seeking equipment certification may specify the emission designator appropriate to its equipment design and proposed operation, provided it meets the technical requirements governing NNA equipment and operations.

To facilitate expedited updates to its technical rules based on evolving technical standards, the Commission delegates joint rulemaking authority to WTB and OET to incorporate into the Commission’s rules, after notice and an opportunity for public comment if necessary or appropriate, any updated version of a previously incorporated technical standard applicable to

UAS operations in the 5030-5091 MHz band. This delegation will help ensure that key technical updates relevant to requirements for authorization of UAS equipment and operations can be incorporated without unnecessary administrative delay.

## **7. Equipment Authorization**

To promote reliability and safety, the Commission will require transmitters to be certified for use in this new part 88 service through compliance with Office of Engineering and Technology (OET) procedures for equipment authorization under part 2, subpart J of the Commission's rules. The Commission will also require that the applicant, when filing the requisite application for equipment certification, notify the FAA of the identity of the equipment manufacturer. This approach will ensure that necessary coordination occurs with the FAA, given its responsibility for ensuring aviation safety in the NAS, and will prevent harmful interference through NNA equipment compliance with the relevant technical requirements.

### **B. Dynamic Frequency Management System**

The Commission will require parties seeking to use or using the NNA spectrum to be registered with a DFMS and to transmit in the 5030-5091 MHz band only pursuant to and consistent with the terms of a frequency assignment from a Commission-approved DFMS. The Commission defines a DFMS as “a frequency coordination system operating in the 5030-5091 MHz band that (1) is highly automated and capable of providing rapid responses to frequency assignment requests from registered NNA operators, and (2) in response to such requests, is capable of assigning to the requesting operator temporary protected use of certain frequencies for a particular geographic area and time period tailored to the operator's submitted operation, to the extent such frequencies are available.”

The Commission will approve any DFMS that can meet its requirements, including approving multiple DFMSs if each of them meets the requirements. Each approved DFMS will be required to provide access to frequencies nationwide, and to communicate and coordinate with the other approved DFMSs as necessary to ensure that their assignments are consistent.

Below, the Commission establishes requirements to govern the DFMS and DFMS administrator and the process by which DFMSs and DFMS administrators will be approved, as well as certain rules governing the request and assignment process.

### **1. DFMS Requirements**

In the *UAS NPRM*, the Commission proposed certain high level requirements to be codified in proposed section 88.135 of the Commission's rules. Among these requirements, the Commission proposed that:

- A DFMS must provide a process for NNA users to register with the system for the purpose of submitting frequency assignment requests and obtaining frequency assignments.
- A DFMS must be capable of responding to frequency assignment requests nationwide and across the entire 5030-5091 MHz band. However, a DFMS may only make assignments for spectrum within those frequencies in which NNA operations are permitted.
- In response to frequency assignment requests from a registered NNA user, a DFMS shall determine and provide, through an automated (non-manual) process, a frequency assignment for a particular geographic area and time period tailored to the NNA user's submitted flight plan, to the extent that frequencies are available to meet the request and the assignment is otherwise consistent with this part. Assignments must provide protected access to frequencies over a duration and geographic area sufficient to cover the entire submitted flight plan.
- Assignments must account for the need to protect other authorized operations.

The Commission adopts these requirements largely as proposed, but modifies the proposed requirements to clarify that it will not mandate that NNA users submit a "flight plan" in connection with their requests. It will still require, however, that requests be for spectrum to support a single UAS flight, which should help to ensure that parties reserve spectrum only for

those times that they actually need the assignment, and to maximize the usage of the NNA spectrum and the resulting benefits. To reflect these determinations, the Commission modifies the proposed requirements to use the term “UAS flight” instead of “flight plan” (e.g., requiring that a DFMS provide a frequency assignment for a particular geographic area and time period tailored to the NNA user’s submitted UAS flight).

*Interference modeling.* While the Commission does not adopt any detailed requirements regarding the methodology or modeling for interference calculations, it agrees with commenters that models and methodologies for interference determinations should be both effective in avoiding harmful interference and consistent between different DFMSs. Accordingly, it adopts these high level requirements.

*FAA authorizations.* The Commission will require a DFMS to confirm through certifications in the frequency assignment request process that the requesting party has flight authorization from the FAA to cover the flight associated with the assignment request, and that the flight will only be piloted by parties that have the necessary FAA remote pilot authorization. While the Commission will have primary responsibility for the enforcement of this Commission requirement, the Commission will coordinate with the FAA as necessary to ensure that oversight and enforcement is effective. In particular, compliance questions regarding the underlying FAA requirements should generally be determined with FAA input. Therefore, the Commission will require anyone challenging a DFMS action with regard to this requirement or otherwise seeking a Commission determination regarding a party’s FAA authorization in this context to submit, with its filing to the Commission, a determination from the FAA regarding whether the party in question has the relevant authorization under FAA rules and requirements.

*In-flight revisions.* The Commission further adds a requirement that a DFMS be capable of responding to in-flight revision requests. The capacity to revise an assignment during a flight will help to address circumstances in which the planned area or duration of operations must be altered during the flight, including NPSTC’s concern that, responding to an emergency, public

safety operators will have difficulty predicting up front the duration of their need for the assignment.

*Communications between DFMS and NNA stations.* The Commission also adds certain requirements for communications between a DFMS and NNA stations to better ensure compliance with DFMS assignments. The Commission is concerned that an approach in which a DFMS merely reviews requests and transmits approved assignments to operators, without any further mechanism or requirement to promote user compliance, will lead to a higher probability of communications occurring outside of authorized parameters, either by intention or accident, and will not achieve the high level of safety and reliability intended for this band. Accordingly, a DFMS is required to be able to communicate directly with a ground station operating in the NNA spectrum, or proxy software acting on its behalf, to achieve the following: (1) ensure that all NNA stations used in the operation, including any ground or airborne stations, are programmed to limit communications in the 5030-5091 MHz band, during the period of the frequency assignment, to the specific frequencies assigned by the DFMS and in accordance with the other terms of the assignment; and (2) receive updates on flight status when a UA has launched and when it has landed. NNA ground stations are similarly required to be capable of communicating with a DFMS as necessary to achieve these functions.

*Limits on requests.* The Commission generally provides flexibility to DFMSs to determine the parameters of the frequency assignment necessary to support the UAS flight, including specific frequencies, bandwidth, maximum transmit power, amount of time, and coverage area. As discussed above, DFMS assignments must provide protected access over a duration and geographic area sufficient to cover the entire submitted UAS flight, but the Commission does not mandate that a DFMS frequency assignment have the specific terms requested.

Two specific restrictions on permissible requests are warranted to prevent monopolization and facilitate broader access to NNA spectrum. First, requests may only be

approved for an operation lasting no more than 24 hours. This restriction is consistent with the intention that assignments provide support for only a single flight. Second, requests may not be approved for periods commencing more than seven calendar days after the submission of the request, except to the extent that lack of frequency availability in that time frame justifies a later assignment. Seven calendar days strikes an appropriate balance between preventing parties from engaging in long term reservation of the spectrum and permitting reservations in advance to provide greater certainty to parties planning their operations. These two limitations are based on predictive judgments regarding the extent and nature of uses of the spectrum and the Commission may modify the specific values as it develops more experience. A DFMS should be capable of implementing such changes to the rules.

*Coordination requirements.* It will be critical, in the event there are multiple DFMSs, that they actively coordinate their assignments to avoid conflicts. Accordingly, the Commission adopts a requirement that a DFMS communicate and coordinate with other DFMSs as necessary to ensure consistent data and assignments, the safe and robust operation of authorized services, and compliance with the rules.

*Information submitted with registration and requests.* Beyond requiring that registration information include the registrant's legal name and contact information, and that requests must address and be limited to the frequencies, duration, and geographic coverage necessary to support a single submitted UAS flight, the Commission does not define the specific information that a party must submit with a frequency assignment request or with registration. It delegates authority to WTB, however, to impose additional specific requirements, after notice and an opportunity for public comment if it deems necessary or appropriate, regarding information that a DFMS must collect regarding registrants or frequency requests, such as the manufacturer, producer, make, or model of the equipment used, that WTB determines will promote the robust and safe use of the band or otherwise address security concerns regarding the use of the band, and the DFMS must have the capability to collect such additional information if required by

WTB or the Commission. Further, to facilitate inter-DFMS coordination, the Commission will mandate that each of the DFMSs require the same registration and request information, and will require that information submitted to the DFMS be accurate, complete, and made in good faith. In addition, consistent with determinations above, the Commission modifies the language in proposed section 88.31(a) to clarify that it does not mandate that assignment requests necessarily must include specific flight plans. It will further require operators to keep any registration information up to date and keep any request information up to date through the scheduled end of the assignment. It will also require that a DFMS maintain all records for at least 60 months.

*Security.* Given the limited record on specific security requirements, however, the Commission adopts a minimum set of high level requirements to address security concerns: (1) a DFMS must employ protocols and procedures to ensure that all communications between the DFMS and users or NNA stations in connection with a DFMS's NNA functions are secure and that unauthorized parties cannot access, shut down, or alter the DFMS or its stored information; (2) communications between users and a DFMS, and between different DFMSs, must be secure to prevent corruption or unauthorized interception of data, and a DFMS must be protected from unauthorized data input or alteration of stored data; and (3) a DFMS must verify that the NNA stations to be used in operations are part 88 FCC-certified devices and must not provide assignments to any other device. In addition, similar to a measure adopted in connection with an Internet-of-Things cybersecurity labeling program, the Commission delegates authority to WTB in coordination with, at a minimum, the Office of the Managing Director (OMD) (specifically the Office of the Chief Information Officer) and, to the extent necessary, the Office of General Counsel (OGC) (specifically the Senior Agency Official for Privacy) to identify and impose on the DFMS any applicable security or privacy requirements arising from Federal law or Federal guidance.

*Protection of other services.* The Commission includes certain requirements regarding the protection of certain non-UAS services, discussed further below. In addition to these, it

adopts a general requirement that a DFMS be capable of receiving reports of interference and requests for additional protection from Microwave Landing System (MLS) users in the 5030-5091 MHz band or authorized users in adjacent bands and promptly address interference issues.

*Non-discrimination.* The Commission adopts a requirement that frequency assignment functions be performed in a non-discriminatory manner, and specifically requires that assignment requests generally be granted in a first-come-first-served manner subject only to the priorities specified in the rules.

*Prioritization.* The Commission adopts two high-level requirements regarding the prioritization of requests. First, in the event of emergencies, a DFMS should, to the extent feasible and consistent with the interests of aviation safety, prioritize requests from public safety entities. The Commission does not permit prioritization in a way that would terminate or modify an NNA user's assignment while the assignments are in use during a UAS flight. As between the many other important private sector uses and critical infrastructure, the non-discrimination principle should apply. Second, the Commission adopts a requirement that, in extended periods of congestion, the DFMS prioritize requests involving flights relying on a single ground station over requests that rely on multiple stations, to the extent feasible and consistent with the interests of aviation safety. This prioritization will still permit operations involving multiple ground stations, while ensuring that the NNA spectrum serves its intended purpose. To the extent that both of the adopted priorities come into play, the public safety priority should take precedence.

## **2. DFMS Administrator Requirements**

In the *UAS NPRM*, the Commission also proposed requirements for DFMS administrators. Specifically, it proposed to require that administrators:

- Operate a DFMS consistent with the rules.
- Establish and follow protocols and procedures to ensure compliance with the rules.
- Provide service for a ten-year term. This term may be renewed at the Commission's discretion.

- Securely transfer all the information in the DFMS to another approved entity in the event it does not continue as the DFMS Administrator at the end of its term. It may charge a reasonable price for such conveyance.
- Develop a standardized process with other DFMS Administrators for coordinating operations with other approved DFMSs, avoiding any conflicting assignments, and maximizing shared use of available frequencies.
- Coordinate with other DFMS Administrators including, to the extent possible, sharing assignment and other information, facilitating non-interference to and from operations relying on assignments from other DFMSs, and other functions necessary to ensure that use of available spectrum is safe and efficient and consistent with this part.
- Ensure that the DFMS shall be available at all times to immediately respond to requests from authorized Commission personnel for any and all information stored or retained by the DFMS.
- Establish and follow protocols to comply with enforcement instructions from the Commission.

The Commission largely adopts these as proposed. Given the critical importance of inter-DFMS coordination to the safety and reliability of the system, it modifies the coordination requirement to reflect that the specified coordination is mandatory rather than a “best efforts” requirement. Further, in addition to the limits it adopts above on requests to prevent monopolization of the NNA spectrum, the Commission also expressly authorizes DFMS administrators to adopt additional reasonable limits as necessary to address similar concerns. Specifically, it provides that the DFMS administrator may implement such reasonable limits on requests as are necessary to prevent the hoarding, warehousing, monopolization, or otherwise excessive reservation of NNA spectrum by a particular party.

As an additional mechanism to assist the Commission in its enforcement responsibilities, DFMS administrators are required to establish and follow protocols to comply with enforcement

instructions from the Commission. The Commission expects detailed enforcement mechanisms and procedures employed by DFMSs to be developed during the approval process described below, including mechanisms and procedures to address unauthorized use of the spectrum, and that most issues will be addressed through these mechanisms and procedures. However, the Commission retains the ultimate responsibility for and authority over NNA operations in the band. In the event that the DFMS is unable to resolve disputes or identify and address the sources of harmful interference or unauthorized or otherwise unlawful operations in the band, these issues may be addressed by the Commission.

The Commission requires a DFMS to immediately respond to requests from authorized Commission personnel for any and all information stored or retained by the DFMS. It also anticipates that other Federal agencies may have important interests in obtaining DFMS information, particularly related to the coordination and protection of Federal UAS operations in the band. Accordingly, it delegates authority to WTB, in consultation with NTIA, to establish a process, as needed, for direct access by Federal agencies to information stored or retained by the DFMS, including the scope and terms of such access, through regulation, guidance, or agreement, as appropriate.

*Fees.* The Commission authorizes administrators to charge reasonable fees for registration, assignments, and other services, including reasonable usage-based fees. DFMS fees will not only be necessary to fund the development and operation of a DFMS, but can provide UAS operators with important incentives to use the limited NNA spectrum efficiently and discourage monopolization, warehousing, or hoarding.

### **3. DFMS and DFMS Administrator Approval Process**

The Commission adopts an approach for review and approval of DFMS and DFMS administrators similar to the Commission's process for selection of Spectrum Access Systems (SASs) and SAS administrators, and delegates authority jointly to WTB and OET to administer this process in close consultation at all stages of the process with the FAA and NTIA, as well as

other administrative authority over the DFMS comparable to the delegation granted to WTB and OET to administer the SASs. It further delegates authority jointly to WTB and the Office of the Managing Director (OMD) to determine fees, if any, in connection with the filing of a petition to be a DFMS administrator. It also direct WTB to obtain Office of Management and Budget review of all information collections associated with this process as required under the Paperwork Reduction Act.

#### **4. Obtaining an Assignment from a DFMS**

In the *UAS NPRM*, the Commission proposed rules governing the process by which parties would obtain an NNA frequency assignment from a DFMS. Among these, it proposed that NNA users registered with a DFMS may submit a request for temporary frequency assignment for CNPC limited to the duration and geographic coverage necessary to support a single submitted UAS flight plan. It further proposed that requests may be made either prior to an operation or submitted during the relevant operation to modify the assignment, and that modification requests must be made to the same DFMS responsible for the original assignment. In addition, it proposed that, if frequencies meeting the request are available, the DFMS would assign them on an exclusive but temporary basis, with the scope of the assignment tailored in both duration and geographic coverage to ensure interference-free communications for the entire submitted UAS flight plan. It also proposed that, when using the services of a DFMS, an NNA user shall comply with all instructions of the DFMS Administrator, including those regarding registration, requests and other submissions to the DFMS, and operational use of NNA assignments.

Consistent with actions discussed above, instead of requiring submission of a “flight plan,” the Commission establishes a more flexible requirement to submit a “UAS flight.” Otherwise, it adopt these provisions substantially as proposed.

#### **5. Interim Access Mechanism**

The Commission establishes an interim access mechanism (IAM) to provide access to the

5030-5091 MHz band during the provisional period before a DFMS is operational. Specifically, the IAM will be available to all eligible NNA operators licensed by rule, and will allow limited, short-term access to 20 megahertz of spectrum in the 5040-5060 MHz band of frequencies. The initial access will only be suitable for NNA operations, which are typically single flights or events. In order for NNA operators to gain access and begin transmission in the 5040-5060 MHz block, they must complete a two-step process, including FAA coordination and FCC registration.

*Transition to DFMS Management of NNA Spectrum.* When a DFMS is first granted final approval, as discussed above, WTB will issue a public notice establishing the date on which the DFMS may begin operations, after which parties seeking access to NNA spectrum must request a frequency assignment from the DFMS. For the DFMS assignment process to reliably determine interference impacts, it is critical that all UAS operations have gone through a DFMS. Accordingly, after the date on which a DFMS first begins operation, parties may not seek or use assignments from the IAM. After such date, the spectrum available for NNA operations will be restricted to 10 megahertz, as discussed above. If WTB finds it appropriate to help ensure a smooth transition, it may establish and announce by public notice a date prior to final approval of a DFMS after which requests will no longer be processed through IAM, but no earlier than the date of the first DFMS conditional approval. Further, WTB is authorized to take any other necessary steps to ensure a smooth transition to the DFMS management of the NNA spectrum, including setting the date for a DFMS to begin operations a sufficient period after the date of final approval to permit all or most of the outstanding IAM approvals to expire.

## **C. Compatibility With Other Services**

### **1. Microwave Landing Systems**

Given that there are no non-Federal Microwave Landing System (MLS) stations in the band, and that the Commission does not anticipate licensing any future MLS systems, it adopts no measures to protect such operations. Because it anticipates continued use of Federal MLS by the Air Force, the Commission will establish exclusion zones to protect such systems. Further, it

will require the DFMS to retain information on, and enforce, the zones sufficient to protect any Federal MLS stations in the 5030-5091 MHz band. The Commission will coordinate with NTIA to identify both the current locations of Federal MLS and the appropriate exclusion zones, after which the exclusion zones will be identified by Public Notice. To the extent that these locations change, such changes can be addressed through a similar process. The Commission delegates authority to WTB to issue the public notice identifying any initial MLS exclusion zones as well and any subsequent public notices necessary to identify changes.

## **2. Radionavigation-satellite Service and AeroMACS**

The Commission concludes that the technical requirements applicable to NNA combined with the frequency separation between the NNA spectrum and the 5010-5030 MHz band will be sufficient to provide compatibility between NNA operations and Radionavigation-satellite Service (RNSS) in the 5010-5030 MHz band. The Commission similarly concludes that the adopted technical requirements, combined with the frequency separation, will be adequate regulatory measures to provide compatibility between NNA operations and AeroMACS in the upper and lower bands adjacent to the 5030-5091 MHz band.

## **3. Aeronautical Mobile Telemetry**

The Commission finds that the limits adopted through incorporation by reference to provisions of RTCA DO-362A are also sufficient to protect Aeronautical Mobile Telemetry (AMT) in the 5091-5150 MHz band. Accordingly, it declines to require NNA operations to also comply with the criteria of ITU-R M.1459.

## **4. Mobile Satellite Service Feeder Links**

The Commission does not anticipate that rule-compliant fixed earth stations in the 5091-5250 MHz band will cause harmful interference to NNA operations in the 5030-5091 MHz band. Nevertheless, to address the unlikely possibility of interference to UAS operations, the Commission clarifies that a Mobile Satellite Service (MSS) feeder link licensee in the 5091-5250 MHz band will only be responsible for curing harmful interference from its earth station to NNA

operations in the neighboring 5030-5091 MHz band to the extent such interference is the result of the licensee's non-compliance with applicable license or regulatory requirements.

## **5. Radio Astronomy**

*National Radio Quiet Zone (NRQZ)*. The Commission requires coordination within the NRQZ. As described in detail below, the coordination requirements are modeled after the NRQZ coordination procedures applicable to other services under section 1.924(a) of the Commission's rules. Because these procedures assume that a station license application is being submitted to the Commission, however, the Commission modifies them to work with the instant context in which a frequency assignment request will be submitted instead to a DFMS. Specifically, it provide that parties planning to operate an NNA station at locations within the NRQZ must notify the National Radio Quiet Zone Administrator (NRQZ Administrator) in writing in advance or simultaneously with the filing of the request. Although section 1.924(a) procedures are limited to fixed permanent stations, the Commission finds that procedures for NNA operations in the 5030-5091 MHz band should apply more broadly. Given the inherently short-term nature of NNA operations, such operations are likely to often rely on temporary stations. Limiting coordination to permanent stations, particularly with the aeronautical focus of the service, might therefore not provide adequate coordination. The Commission also adopts, however, two measures to reduce the burden of coordinating short term operations. First, it provides that the NRQZ Administrator may provide safe harbors for NNA operations in the NRQZ that do not require notification, but a party submitting a frequency assignment request under this exception must certify that their request meets the criteria for a safe harbor and provide any additional supporting documentation required by the DFMS. Further, if a party's operation or revision of an operation is within the scope of an approval previously granted to the party by the NRQZ Administrator, including any time limits on the approval, altitude limits, or other applicable conditions, the party need not provide notification of the operation or revision to the NRQZ Administrator, but must submit the approval with its assignment request.

CORF recommends that the coordination notice should be sent to nrqz@nrao.edu. The Commission adopts the same mailing address specified in section 1.924(a) and applicable to every other service as the initial point of contact, but also permits notification to be sent by electronic mail to nrqz@nrao.edu, which should facilitate a more rapid coordination. The coordination process based on this notification will largely follow the procedures under section 1.924(a), with appropriate changes made to reflect the role of the DFMS. Thus, when a request for frequency assignment is filed with the DFMS, the notification may be submitted prior to or simultaneously with the request. After receipt, the DFMS will allow a period of 20 days for objections. If a DFMS determines that a request is subject to one of the two exceptions to notification discussed above, it shall process the request without waiting the 20-day period.

If a DFMS receives an NRQZ Administrator approval of operations that includes the operation associated with the request, if the request is within the scope of a safe harbor established by the NRQZ Administrator, or if the 20-day period passes without objection, the DFMS shall process the request under normal procedures, except with regard to the restriction established above that requests may not be granted more than seven calendar days in advance. To accommodate the 20-day period for objections, the Commission provides that, when this period is applicable, requests may be approved for periods commencing more than seven calendar days after the submission of the request, but no more than seven calendar days after the date of DFMS decision. If objections are received in the 20-day period, the DFMS administrator will forward the record, including the frequency request, to the Commission. After consideration of the record, the Commission will take whatever action is deemed appropriate, including, potentially, providing direction to the relevant DFMS administrator regarding resolution of the request.

*RAS Outside the NRQZ.* With regard to radio astronomy observations in the adjacent 4990-5000 MHz band, the Commission confirms, as recommended by NTIA and other commenters, that NNA operations remain subject to footnote US211 of the Table of Allocations.

The Commission declines to adopt CORF's proposal for exclusion zones to protect observations at sites in both the 4990-5000 MHz band and inside the 5030-5091 MHz band. To facilitate operation of both UAS systems and radio astronomy systems, however, it will require a DFMS to immediately notify the National Science Foundation, Division of Astronomical Sciences, Electromagnetic Spectrum Management Unit, by email of any assignments that it approves for UAS operations in the vicinity of the radio astronomy facilities identified in footnote US385 of the Table of Allocations, which identifies the sites at which radio astronomy observations are performed in 4990-5000 MHz. Further, for clarity, the Commission will list these facilities in the relevant part 88 rule.

## **6. Canadian and Mexican Coordination**

The Commission does not adopt any measure at this time to address operations near the border. Instead, DFMS administrators will be required to demonstrate that their systems can and will enforce agreements between the U.S., Canadian, and Mexican governments regarding commercial operations in the 5030-5091 MHz Band. The specific methods of enforcement will be determined and implemented by DFMS administrators, with appropriate Commission oversight, after such agreements are in place.

### **Procedural Matters**

*Regulatory Flexibility Act.* The Regulatory Flexibility Act of 1980, as amended (RFA), requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that "the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities." Accordingly, the Commission has prepared a Final Regulatory Flexibility Analysis (FRFA), below, concerning rule and policy changes in the *Report and Order*.

*Paperwork Reduction Act.* The *Report and Order* contains new information collection requirements subject to the Paperwork Reduction Act of 1995 (PRA), Public Law 104-13. All such new requirements will be submitted to the Office of Management and Budget (OMB) for

review under section 3507(d) of the PRA. OMB, the general public, and other Federal agencies will be invited to comment on any new or modified information collection requirements contained in this proceeding. The Commission will publish a separate document in the *Federal Register* at a later date seeking these comments.

*Congressional Review Act.* The Commission has determined, and the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, concurs, that this rule is non-major under the Congressional Review Act, 5 U.S.C. 804(2). The Commission will send a copy of the *Report and Order* to Congress and the Government Accountability Office pursuant to 5 U.S.C. 801(a)(1)(A).

*Accessing Materials.* The Office of Federal Register (OFR) regulations require that agencies must discuss in the preamble to the *Federal Register* summary of a final rule the ways that the materials incorporated by reference are reasonably available to interested parties and that interested parties can obtain the materials. In addition, OFR regulations require that the preamble to the *Federal Register* summary of a final rule summarize the material incorporated by reference.

Sections 88.101, 88.103, 88.105, 88.107, and 88.109 of the rules adopted herein incorporate by reference certain requirements in standards established by the RTCA Special Committee-228, referred to as RTCA, Inc. Command and Control (C2) Data Link Minimum Operational Performance Standards (MOPS) (Terrestrial), RTCA-DO-362A (December 17, 2020). These standards provide the technical requirements for equipment manufacturers and operators of equipment used for UAS NNA operations in the 5030-5091 MHz band. In particular, the standards provide information regarding the following technical parameters: transmitter output power, emissions bandwidth, out-of-band emissions, emission mask, and the applicable time division duplexing frame rate. The text of RTCA DO-362A is available online for a fee at <https://my.rtca.org/productdetails?id=a1B1R00000LoYFZUA3>.

## **Final Regulatory Flexibility Analysis**

As required by the Regulatory Flexibility Act of 1980, as amended (RFA), an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Spectrum Rules and Policies for the Operation of Unmanned Aircraft Systems; Petition of AIA for Rulemaking to Adopt Service Rules for Unmanned Aircraft Systems Command and Control in the 5030-5091 MHz Band, Notice of Proposed Rulemaking (NPRM)* released in January 2023. The Federal Communications Commission (Commission) sought written public comment on the proposals in the *NPRM*, including comments on the IRFA. No comments were filed addressing the IRFA. This Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.

**A. Need for, and Objectives of, the Report and Order**

In the *Report and Order*, the Commission takes significant action to adopt initial service rules for uncrewed aircraft systems (UAS) in the 5030-5091 MHz band and enable UAS operators to access dedicated spectrum with the required reliability to support safety-of-flight, control-related communications while also allowing flexibility for the industry to further develop. Specifically, the Commission adopts service rules that provide operators the ability to obtain direct frequency assignments in a portion of the 5030-5091 MHz band. These service rules are necessary to provide a critical first step to promote access by UAS operators to dedicated spectrum while also allowing a consensus to emerge on key issues for this industry. Achieving the extraordinary potential of UAS technology will require integrating UAS operations into the National Airspace System (NAS), including in the controlled airspace in which commercial passenger flights operate and in circumstances with heightened risk, such as flights involving large aircraft or carrying passengers or flights beyond line of sight of the remote pilot. To ensure that these flights are sufficiently safe for routine operation, highly reliable wireless two-way communications for flight control and telemetry are required. Therefore, the Commission adopts initial service rules for the 5030-5091 MHz band.

In furtherance of these objectives, the Commission adopts service rules where one or more dynamic frequency management systems (DFMSs) will manage and coordinate access to

the spectrum and enable its safe and efficient use, by providing requesting operators with temporary frequency assignments to support UAS control link communications with a level of reliability suitable for operations in controlled airspace and other safety-critical circumstances. To provide this level of reliability, the Commission adopts technical requirements drawn from minimum operational performance standards that were developed by an aviation industry standards body specifically to support UAS control links in the 5030-5091 MHz band and were approved by the Federal Aviation Administration (FAA) for this purpose. To address concerns regarding the impact of these aeronautical operations on adjacent services, the Commission locates these operations, for now, in the central part of the band, with substantial separation from the bands adjacent to the 5030-5091 MHz band. The Commission finds wide support in the record for enabling early, direct access to a portion of the band for protected assignments under DFMS coordination and expects that such access will help to facilitate the safe integration of UAS operations into the NAS so that the United States can realize the enormous potential benefits that UAS operations can provide.

The Commission is addressing service rules for UAS operations in the 5030-5091 MHz band in phases. In this initial step, the Commission opens a portion of the band for NNA operations to enable early, low-cost access to the benefits of dedicated spectrum for UAS control communications. The Commission anticipates that subsequent phases will address broader use of the band, potentially with the assistance of a Federal Advisory Committee or other efforts to further assess and engage stakeholders on the potential uses of the band and the appropriate regulatory measures to enable such uses, including but not limited to studies pursuant to the implementation of the National Spectrum Strategy. In subsequent phases, the Commission intends to resolve issues including (1) the final band plan for the 5030-5091 MHz band, which may include moving NNA operations to another location in the band; (2) measures to ensure compatibility between UAS stations operating at and near the edges of the 5030-5091 MHz band and services in adjacent spectrum; and (3) service rules for exclusive-use licenses enabling

network-supported services in the band, including the scope of such services. The Commission further intends to continue close coordination with our Federal partners, including the FAA and the National Telecommunications and Information Administration (NTIA), to ensure that UAS operations supported by this band remain compatible with aviation safety and concerns, and to develop an appropriate long-term framework for the accommodation of Federal agencies seeking access to the Federal allocation in the band for their own UAS operations.

**B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA**

There were no comments filed that specifically addressed the rules and policies proposed in the IRFA.

**C. Response to Comments by the Chief Counsel for Advocacy of the Small Business Administration**

Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments. The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

**D. Description and Estimate of the Number of Small Entities to Which the Rules Will Apply**

The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the rules adopted herein. The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.” In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act. A small business concern is one that: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by

the SBA.

*Small Businesses, Small Organizations, Small Governmental Jurisdictions.* Our actions, over time, may affect small entities that are not easily categorized at present. The Commission therefore describes, at the outset, three broad groups of small entities that could be directly affected herein. First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the Small Business Administration's (SBA) Office of Advocacy, in general a small business is an independent business having fewer than 500 employees. These types of small businesses represent 99.9% of all businesses in the United States, which translates to 33.2 million businesses.

Next, the type of small entity described as a "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field." The Internal Revenue Service (IRS) uses a revenue benchmark of \$50,000 or less to delineate its annual electronic filing requirements for small exempt organizations. Nationwide, for tax year 2022, there were approximately 530,109 small exempt organizations in the U.S. reporting revenues of \$50,000 or less according to the registration and tax data for exempt organizations available from the IRS.

Finally, the small entity described as a "small governmental jurisdiction" is defined generally as "governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand." U.S. Census Bureau data from the 2022 Census of Governments indicate there were 90,837 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States. Of this number, there were 36,845 general purpose governments (county, municipal, and town or township) with populations of less than 50,000 and 11,879 special purpose governments (independent school districts) with enrollment populations of less than 50,000. Accordingly, based on the 2022 U.S. Census of Governments data, the Commission estimates that at least 48,724 entities fall into the category of "small governmental jurisdictions."

*Wireless Telecommunications Carriers (except Satellite).* This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular services, paging services, wireless Internet access, and wireless video services. The SBA size standard for this industry classifies a business as small if it has 1,500 or fewer employees. U.S. Census Bureau data for 2017 show that there were 2,893 firms in this industry that operated for the entire year. Of that number, 2,837 firms employed fewer than 250 employees. Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 594 providers that reported they were engaged in the provision of wireless services. Of these providers, the Commission estimates that 511 providers have 1,500 or fewer employees. Consequently, using the SBA's small business size standard, most of these providers can be considered small entities.

*Satellite Telecommunications.* This industry comprises firms "primarily engaged in providing telecommunications services to other establishments in the telecommunications and broadcasting industries by forwarding and receiving communications signals via a system of satellites or reselling satellite telecommunications." Satellite telecommunications service providers include satellite and earth station operators. The SBA small business size standard for this industry classifies a business with \$38.5 million or less in annual receipts as small. U.S. Census Bureau data for 2017 show that 275 firms in this industry operated for the entire year. Of this number, 242 firms had revenue of less than \$25 million. Additionally, based on Commission data in the 2022 Universal Service Monitoring Report, as of December 31, 2021, there were 65 providers that reported they were engaged in the provision of satellite telecommunications services. Of these providers, the Commission estimates that approximately 42 providers have 1,500 or fewer employees. Consequently, using the SBA's small business size standard, a little more than half of these providers can be considered small entities.

*All Other Telecommunications.* This industry is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation. This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems. Providers of Internet services (e.g. dial-up ISPs) or Voice over Internet Protocol (VoIP) services, via client-supplied telecommunications connections are also included in this industry. The SBA small business size standard for this industry classifies firms with annual receipts of \$35 million or less as small. U.S. Census Bureau data for 2017 show that there were 1,079 firms in this industry that operated for the entire year. Of those firms, 1,039 had revenue of less than \$25 million. Based on this data, the Commission estimates that the majority of “All Other Telecommunications” firms can be considered small.

*Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment. Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment. The SBA small business size standard for this industry classifies businesses having 1,250 employees or less as small. U.S. Census Bureau data for 2017 show that there were 656 firms in this industry that operated for the entire year. Of this number, 624 firms had fewer than 250 employees. Thus, under the SBA size standard, the majority of firms in this industry can be considered small.

*Uncrewed Aircraft Radio Equipment Manufacturers.* Neither the SBA nor the Commission have developed a small business size standard specifically applicable to uncrewed aircraft radio equipment manufacturers. Radio and Television Broadcasting and Wireless

Communications Equipment Manufacturing is the closest industry with an SBA small business size standard. The SBA small business size standard for this industry classifies businesses having 1,250 employees or less as small. U.S. Census Bureau data for 2017 show that there were 656 firms in this industry that operated for the entire year. Of this number, 624 firms had fewer than 250 employees. In addition, the SBA provides a size standard for the Aircraft Manufacturing industry, which includes the manufacture of uncrewed and robotic aircraft. The SBA small business size standard for this industry classifies businesses having 1,500 employees or less as small. U.S. Census Bureau data for 2017 show that there were 254 firms in this industry that operated for the entire year. Of this number, 227 firms had fewer than 250 employees. Based on this data, the Commission concludes that a majority of manufacturers in this industry are small.

*Uncrewed Aircraft System Operators.* Neither the Commission nor the SBA have developed a small business size standard specifically applicable to UAS operators. The Commission lacks data on the number of operators in the United States that could be subject to the rules, therefore it is not possible to determine the number of affected small entity operators at this time. The Commission finds, however, that the Regulatory Flexibility Analysis of the FAA Remote ID rule is helpful. In this analysis, the FAA assessed the impact of the rule on small entity non-recreational UAS operators based on an analysis that the Association for Uncrewed Vehicle Systems International (AUVSI) performed relating to part 107 waivers. In the analysis, the AUVSI determined that 92 percent of the waivers were issued to entities with fewer than 100 employees. Based on this data, the FAA determined that a majority of entities currently operating uncrewed aircraft for other than recreational purposes are small. Accordingly, based on the FAA's determination, the Commission concludes that a majority of uncrewed UAS operators are small entities.

**E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities**

The rules adopted in the *Report and Order* will implement new reporting, recordkeeping, or other compliance requirements on certain small entities. These requirements, which are summarized below, were thoughtfully considered to minimize burdens to small businesses while also ensuring the level of reliability necessary to support safety-critical UAS communications. The Commission does not expect compliance with the rules adopted in the *Report and Order* to cause small entities to incur significant compliance costs. The Commission further notes that while it sought comment from concerned parties regarding costs related to compliance requirements, the record did not include concerns raised by small entities about compliance costs.

*Dynamic Frequency Management System.* The *Report and Order* permits more than one DFMS administrator to operate a DFMS in the band, and each approved DFMS will be required to communicate and coordinate with other approved DFMSs as necessary to ensure that their assignments are consistent. It will be critical for DFMS administrators to agree on and implement appropriate DFMS-to-DFMS lines of communication, as well as protocols for coordination and common interference models, that ensure any inconsistencies in assignments are avoided or are otherwise very quickly identified and resolved. Furthermore, the Commission establishes requirements that are high-level guidelines that describe minimum requirements for DFMSs and DFMS administrators. A DFMS will require sufficient information regarding the time, relevant geographic area, and, potentially, altitude of a UAS operation to model potential interference impacts; however, the Commission does not intend to specify the particular content or format of that information, but to give stakeholders flexibility to develop standards to implement this requirement. The requests must be for spectrum to support a single UAS flight, which should help to ensure that parties reserve spectrum only for those times and frequencies that they actually need, and to maximize the usage of the NNA spectrum.

The *Report and Order* adopts the proposed section 88.135 requirements from the *NPRM*, which include that (1) a DFMS must provide a process for NNA users to register with the system

for the purpose of submitting frequency assignment requests and obtaining frequency assignments; (2) a DFMS must be capable of processing frequency assignment requests nationwide and across the entire 5030-5091 MHz band; however, a DFMS may only make assignments for spectrum within those frequencies in which NNA operations are permitted; (3) a DFMS shall determine and provide, through an automated (non-manual) process, an assignment of frequencies for a particular geographic area and time period; and (4) assignments must account for the need to protect other authorized operations.

The Commission also incorporates a high-level requirement regarding the process of interference calculations. While the Commission does not adopt any detailed requirements regarding the methodology or modeling for interference calculations, the Commission agrees that the models and methodologies for interference determinations should be both accurate and consistent between different DFMSs. The Commission envisions that stakeholders will establish detailed standards for specific models and methods that meet the Commission's requirements, but emphasizes that any standards established must be in compliance with the rules.

Furthermore, the Commission includes a requirement to help ensure that parties requesting frequency assignments have the necessary FAA pilot and flight authorizations, obligating a DFMS to confirm through certifications that the party requesting a frequency assignment has flight authorization from the FAA to cover the flight associated with the assignment request, and that the flight will only be piloted by parties that have the necessary FAA remote pilot authorization. The Commission does not expect this requirement to be time-consuming because, while a DFMS may implement additional measures to obtain confirmation, the Commission only requires it to implement certifications. Further, the Commission finds that it will provide further assurance that the NNA spectrum is used for authorized purposes. Finally, the Commission adopts a requirement that a DFMS be capable of responding to in-flight revision requests.

Additionally, the Commission authorizes certain requirements for communications between DFMS and NNA stations to better ensure compliance with DFMS assignments,

specifically that a DFMS be able to communicate directly with a ground station operating in the NNA spectrum, or proxy software acting on its behalf, to achieve the following: (1) ensure that all NNA stations used in the operation, including any ground or airborne stations, are programmed to limit communications in the 5030-5091 MHz band, during the period of the frequency assignment, to the specific frequencies assigned by the DFMS and in accordance with the other terms of the assignment; and (2) receive updates on flight status when an uncrewed aircraft has launched and when it has landed. The Commission will similarly require NNA ground stations to be capable of communicating with a DFMS as necessary to achieve these functions. These obligations will better ensure compliance with DFMS assignments.

In seeking to address concerns that a party may hoard or monopolize the limited spectrum available for NNA operations, the Commission adopts requirements that a DFMS grant assignments sufficient to provide protected access over a duration and geographic area sufficient to cover the entire submitted UAS flight but does not mandate that a DFMS frequency assignment have the specific terms requested. These are solely high-level obligations, and the Commission does not wish to preclude administrators from developing common policies, standards, or approaches regarding the assessment and granting of requests to better meet the industry's collective need for this limited spectrum resource. To further ensure prevention of monopolization and facilitate broader access to NNA spectrum, the Commission provides that requests may only be approved for an operation lasting no more than 24 hours and provides that requests may not be approved for periods commencing eight or more calendar days after the submission of the request, except to the extent that lack of frequency availability in that time frame justifies a later assignment. The Commission also adopts a requirement that a DFMS communicate and coordinate with other DFMSs as necessary to ensure consistent data and assignments, the safe and robust operation of authorized services, and compliance with the rules to ensure the proper functioning of the DFMSs.

The Commission does not define the specific information that a party must submit with a

frequency assignment request or with registration. To facilitate inter-DFMS coordination, the Commission will mandate that each DFMS require the same registration and request information, and that information submitted to a DFMS be true, complete, correct, and made in good faith. The Commission will further require operators to keep any registration information up to date and keep any request information up to date through the scheduled end of the assignment. Further, the Commission will require a DFMS to maintain all records for at least 60 months.

Regarding security, the Commission adopts high-level requirements that (1) a DFMS must employ protocols and procedures to ensure that all communications between the DFMS and users or NNA stations in connection with a DFMS's NNA functions are secure and that unauthorized parties cannot access, shut down, or alter the DFMS or its stored information; and (2) communications between users and a DFMS, and between different DFMSs, must be secure to prevent corruption or unauthorized interception of data, and a DFMS must be protected from unauthorized data input or alteration of stored data; and (3) a DFMS must verify that the NNA stations to be used in operations are FCC-certified devices and must not provide assignments to an uncertified device.

Furthermore, the Commission adopts two high-level requirements regarding the prioritization of requests. While the Commission will generally require the DFMS to process requests in a non-discriminatory, first-come-first-served manner, the Commission finds that two priorities in the event of congestion are in the public interest. First, the Commission provides that, in the event of emergencies, a DFMS should, to the extent feasible and consistent with the interests of aviation safety, prioritize requests from public safety entities. The Commission expects that, as with other high-level requirements, stakeholders will develop common standards regarding who qualifies as public safety entities and other such questions. Second, the Commission adopts a requirement that, in extended periods of congestion, the DFMS prioritize requests involving flights relying on a single ground station over requests that rely on multiple

stations, to the extent feasible and consistent with the interests of aviation safety. For both of these requirements, the Commission anticipates that stakeholders will work collaboratively to develop appropriate standards and practices to implement them.

The Commission also adopts several requirements for DFMS administrators. These obligations include: (1) operate a DFMS consistent with the rules; (2) establish and follow protocols and procedures to ensure compliance with the rules; (3) provide service for a ten-year term, which may be renewed at the Commission's discretion; (4) securely transfer all the information in the DFMS to another approved entity in the event it does not continue as the DFMS administrator at the end of its term; (5) develop a standardized process with other DFMS administrators for coordinating operations with other approved DFMSs, avoiding any conflicting assignments, and maximizing shared use of available frequencies; (6) coordinate with other DFMS administrators including sharing assignment and other information, facilitating non-interference to and from operations relying on assignments from other DFMSs, and other functions necessary to ensure that use of available spectrum is safe and efficient and consistent with the rules; (7) ensure that the DFMS shall be available at all times to immediately respond to requests from authorized Commission personnel for any and all information stored or retained by the DFMS; (8) establish and follow protocols to comply with enforcement instructions from the Commission; and (9) implement such reasonable limits on requests as are necessary to prevent the hoarding, warehousing, monopolization, or otherwise excessive reservation of NNA spectrum by a particular party.

To assist in its enforcement responsibilities, the Commission adopts a requirement that DFMS administrators establish and follow protocols to comply with enforcement instructions from the Commission. The Commission expects detailed enforcement mechanisms and procedures employed by DFMSs to be developed during the approval process, including mechanisms and procedures to address unauthorized use of the spectrum, and the Commission anticipates that most issues will be addressed through these mechanisms.

*Radionavigation-Satellite Service.* The 5010-5030 MHz band includes an allocation for the radionavigation-satellite service (RNSS) (space-to-Earth) for potential future use. Footnote 5.443C of the Table of Frequency Allocations addresses requirements in the 5030-5091 MHz band for the protection of RNSS downlinks. Specifically, it provides that “[u]nwanted emissions from the aeronautical mobile (R) service in the frequency band 5030-5091 MHz shall be limited to protect RNSS system downlinks in the adjacent 5010-5030 MHz band” and that “[u]ntil such time that an appropriate value is established in a relevant International Telecommunication Union Radiocommunication Sector (ITU-R) Recommendation, the equivalent isotropic radiated power density limit of -75 dBW/MHz in the frequency band 5010-5030 MHz for any AM(R)S station unwanted emission should be used.” Footnote 5.443C further limits aeronautical mobile (route) service (AM(R)S) use of the 5030-5091 MHz band to “internationally standardized aeronautical systems.” As NNA operations services would be part of the AM(R)S allocation, the requirements of footnote 5.443C would apply to such operations in the 5030-5091 MHz band.

*AeroMACS.* AeroMACS is a wireless broadband aeronautical mobile (route) service system that will enable communications for surface operations at airports between aircraft and other vehicles and between other critical fixed assets. The Commission allocated both the 5000-5030 MHz and 5091-5150 MHz bands for such use but has not yet established service rules in either band. The AeroMACS allocation for 5010-5030 MHz further provides that in making assignments for this band, attempts shall first be made to satisfy requirements in the bands 5000-5010 MHz and 5091-5150 MHz. The Commission concludes that the adopted technical requirements, combined with the frequency separation, will be adequate regulatory measures to provide compatibility between NNA operations and AeroMACS in the upper and lower band. These limits are drawn from the technical requirements of RTCA DO-362A, which are detailed below.

*Aeronautical Mobile Telemetry.* The 5091-5150 MHz band is also allocated for Federal and non-Federal aeronautical mobile telemetry (AMT) communications from aircraft stations,

subject to the technical parameters in ITU Resolution 418 (WRC-12) intended to ensure compatibility with other services. According to the NTIA, Federal agencies currently use this allocation in the 5091-5150 MHz band to support flight testing. The band is similarly used for non-Federal flight-testing operations. As specified in footnote US111 of the Table of Allocations, flight testing in the 5091-5150 MHz band is conducted at seventeen locations, and additional locations may be authorized on a case-by-case basis. The Commission finds that the limits adopted today, drawn from RTCA DO-362A, are sufficient to protect AMT.

*Mobile Satellite Service Earth Stations.* As specified in the footnote US444A of the Table of Allocations, the 5091-5250 MHz band is also allocated to the fixed-satellite service (Earth-to-space) on a primary basis for non-Federal use, limited to feeder links of non-geostationary satellite systems in the Mobile Satellite Service (MSS). After January 1, 2016, the 5091-5150 MHz portion of this allocation permitted no new assignments. Globalstar operates gateway earth stations in the 5096-5250 MHz band under this allocation as part of its global mobile satellite service. To address the unlikely possibility of interference with UAS operations, the Commission clarifies that the responsibility to resolve interference between rule-compliant MSS earth stations and UAS is on the new UAS services. MSS earth station licensees in the 5091-5250 MHz band will only be responsible for curing harmful interference from its earth station to NNA operations in the neighboring 5030-5091 MHz band to the extent such interference is the result of the licensee's non-compliance with applicable license or regulatory requirements.

*Radio Astronomy.* In the *Report and Order*, the Commission requires coordination within the National Radio Quiet Zone (NRQZ). The coordination requirements are modeled after the NRQZ coordination procedures applicable to other services under section 1.924(a) of the Commission's rules but modified to work with the instant context in which a frequency assignment request will be submitted instead to a DFMS. Specifically, the Commission provides that parties planning to operate an NNA station at locations within the NRQZ must notify the

NRQZ Administrator in writing in advance or simultaneously with the filing of the request. To reduce the burden of coordinating short term operations, the Commission adopts two measures: a provision that the NRQZ Administrator may establish a safe harbor for NNA operations in the NRQZ that do not require notification and a measure that a party need not notify the NRQZ Administrator if the party's operation or revision of an operation is within the scope of an approval previously granted to the party by the NRQZ Administrator. Furthermore, the coordination process will largely follow the procedures under section 1.924(a), with appropriate changes made to reflect the role of the DFMS. Thus, when a request for frequency assignment is filed with the DFMS, the notification may be submitted prior to or simultaneously with the request. After receipt, the DFMS will allow a period of 20 days for objections. If a DFMS determines that a request is subject to one of the two exceptions to notification, it shall process the request without waiting the 20-day period. If the DFMS receives a NRQZ Administrator approval of operations that includes the operation associated with the request, if the request is within the scope of a safe harbor established by the NRQZ Administrator, or if the 20-day period passes without objection, the DFMS will process the request under normal procedures, except that requests may be approved for periods commencing more than seven calendar days after the submission of the request, but no more than seven calendar days after the date of decision. If objections are received in the 20-day period, the DFMS will forward the record, including the frequency request, to the Commission. After consideration of the record, the Commission will take whatever action is deemed appropriate, including, potentially, directions to the DFMS administrator regarding resolution of the request. Finally, to facilitate operation of both UAS systems and radio astronomy systems, the Commission requires a DFMS to immediately notify the National Science Foundation, Division of Astronomical Sciences, Electromagnetic Spectrum Management Unit, by email of any assignments that it approves for UAS operations in the vicinity of the radio astronomy facilities identified in footnote US385 of the Table of Allocations, which identifies the sites at which radio astronomy observations are performed in

4990-5000 MHz.

*Canadian and Mexican Coordination.* International agreements with Mexico and Canada do not currently address the use of the 5030-5091 MHz band for UAS communications near the borders with those countries. DFMS administrators will be required to demonstrate that their systems can and will enforce agreements between the United States, Canadian, and Mexican governments regarding commercial operations in the 5030-5091 MHz Band. The specific methods of enforcement will be determined and implemented by DFMS administrators, with appropriate Commission oversight, after the agreements are in place.

*Interim Access Mechanism Registration.* The Commission adopts an interim access mechanism (IAM) to enable NNA entities to begin operations in the band during the interim period before the DFMS is operational. For IAM access, NNA operators holding an FAA authorization must subsequently complete an on-line NNA registration form with the Commission providing various basic information and certifications, including a company or individual name, email address, and the following certification statements: (1) they have complied with the FAA authorization process; (2) they have/will comply with the Commission's NNA rules and technical requirements; (3) all equipment utilized in NNA operations meets the equipment certification requirements; and (4) their authorization to use the IAM assignment terminates immediately in the event a DFMS becomes operational prior to the end of the IAM assignment. This registration process will not require a fee, or any subsequent review process. Once the registration form is completed and submitted, a confirmation number of their registration will be provided and NNA operations can commence immediately. During the IAM, the Commission will work with the FAA to resolve disputes or identify and address the sources of harmful interference or unauthorized operations in the 5030-5091 MHz band.

*Compliance with RTCA DO-362A.* In the *Report and Order*, the Commission adopts rules based on RTCA DO-362A, which contains Minimum Operational Performance Standards for terrestrial-based control-and-non-payload communications (CNPC) point-to-point or point-

to-multipoint links in the 5030-5091 MHz band, including power limits, emission limits, and frequency accuracy requirements. UAS entities are likely familiar with RTCA DO-362A as the FAA recently issued a Technical Standard Order (TSO) establishing minimum standards in the 5030-5091 MHz band based on the requirements in the RTCA DO-362A. It is appropriate to adopt technical requirements based on the RTCA DO-362A for governing the types of safety-of-flight UAS operations in the 5030-5091 MHz band as these requirements are consistent with the AM(R)S allocation for the band, the limitations associated with CNPC-only operations, and because they are consistent with FAA standards.

First, as recommended by RTCA, the Commission adopts the requirement of RTCA DO-362A standard related to Time Division Duplexing (TDD) for NNA equipment and operations in the band. To minimize the risk of interference and to achieve consistency with the FAA TSO based on the RTCA DO-362A standard, the Commission finds it appropriate at this time to incorporate into its rules the 50 ms TDD frame structure requirement for NAA equipment and operations for CNPC purposes in the 5030-5091 MHz band. Second, the Commission declines to follow the requirements of rule section 87.139(c) to avoid imposing potentially inconsistent out-of-band emissions requirements with the FAA, which mandates compliance with applicable emissions requirements in section 2 of the RTCA DO-362A standard. To provide stakeholders increased flexibility, and in lieu of mandating the use of specific emission designators, the Commission will permit an applicant seeking equipment certification to specify the emission designator appropriate to its equipment design and proposed operation, provided it meets the technical requirements adopted today governing NNA equipment and operations. Finally, the Commission delegates joint rulemaking authority to the Wireless Telecommunications Bureau (WTB) and the Office of Engineering and Technology (OET) to incorporate into the Commission's rules, after notice and an opportunity for public comment, any updated version of a previously incorporated technical standard applicable to UAS operations in the 5030-5091 MHz band. This delegation will facilitate expedited updates to the Commission's technical rules

based on evolving technical standards. The Commission seeks to expedite necessary future changes to accommodate updates in standards relevant to previously adopted technical requirements.

*Equipment Authorization.* The Commission adopts the *NPRM*'s proposal to mandate equipment authorization requirements similar to those under sections 87.145 and 87.147 of the Commission's rules to all equipment intended for use in the 5030-5091 MHz band. Section 87.145 requires that each transmitter must be certified for use in the relevant service, and section 87.147 establishes a specific equipment authorization for part 87 equipment, which for the frequencies in the 5030-5091 MHz band, among others, requires coordination with the FAA. The *NPRM*'s stated goal was to ensure that such equipment meets the level of reliability and safety necessary of aviation equipment. The Commission noted that 5030-5091 MHz UAS radio equipment must independently satisfy any applicable FAA requirements and anticipated that this coordination process would ensure that the 5030-5091 MHz equipment authorizations by the Commission and the FAA are consistent and that all equipment approved for use in the band will meet both agencies' requirements. The Commission adopts these requirements as well as requirements that transmitters be certified for use in the relevant service through compliance with OET procedures for equipment authorization under part 2, subpart J of the Commission's rules and provide notification to the FAA when filing the requisite application. This approach will ensure that necessary coordination occurs with the FAA, given its responsibility for ensuring aviation safety in the National Airspace System, and prevent harmful interference through NNA equipment compliance with the relevant technical requirements. The entities required to comply with equipment authorization will primarily be equipment manufacturers, some of which include small entities. Likewise, all entities—including small entities—will use this authorized equipment.

**F. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered**

In the discussion of the issues the *NPRM* sought comment on, the Commission raised alternatives and sought input such as technical studies and cost-benefit analyses from small and other entities. By requesting such information, the Commission gave small entities the opportunity to broaden the scope of the Commission's understanding of impacts, which may be readily apparent, and offer alternatives not already considered that could minimize the economic impact on small entities. The Commission has adopted alternatives that will minimize compliance burdens on small entities, as described below.

*Industry-focused, Multi-phase Rulemaking.* In adopting these service rules, the Commission intends for rules and policies to be adopted in phases to ensure flexibility and innovation for this industry. This initial phase adopts high-level rules that describe minimum requirements for operation of the DFMS and encourages a multi-stakeholder group addressing issues in the band to work collaboratively to develop technical specifications and standards for DFMS operation, and to explore other issues related to the evolving demands in the band. This approach will allow small entities, to collaborate and reach a consensus on key issues and present innovative solutions satisfactory to the involved parties.

Although it imposes new requirements that could impact small entities, in establishing these rules, the Commission balances the administrative burden to entities with ensuring flight safety and protecting against interference in a manner that minimizes the impact to all UAS operators, including small entities. In this initial step, the Commission opens a portion of the band for NNA operations to enable early, low-cost access to dedicated spectrum for UAS control communications. By providing low-cost access, small entities will be able to utilize this spectrum without a significant financial cost.

*Licensing Stations by Rule.* In the *Report and Order*, the Commission adopts a licensing approach that would not require individual licensing, which will reduce the administrative burdens on small entities who are UAS operators and the Commission. The Commission implements a license-by-rule authorization for NNA operations, pursuant to section 307(e) of the

Communications Act, as amended. Under this license-by-rule framework, parties using rule-compliant stations and operating in compliance with the rules would only need to obtain the requisite temporary frequency assignment from the DFMS in order to have Commission authorization to transmit in the band in the assigned location, frequency, and timeframe. To obtain Commission authorization to use the NNA spectrum, NNA users must use certified, Commission-approved NNA stations, and comply with the applicable NNA rules, but need not obtain individual spectrum licenses from the Commission. A license-by-rule approach will minimize the administrative burdens on users and the Commission and facilitate use of NNA for exclusive, short-term assignments focused on specific needs and operations.

The Commission has found that a license-by-rule approach will also minimize the burden on small businesses and expedite the process for UAS operators. More specifically, the Commission finds that licensing by rule of NNA stations will serve the public interest, convenience, and necessity and promote the efficient and robust use of the NNA spectrum. A license-by-rule approach to use the NNA band will avoid the administrative burdens on users and the Commission that would be involved if NNA operations were licensed individually, facilitating the use of NNA for short-term (but exclusive) assignments focused on specific needs and operations rather than longer term authorizations used only intermittently. In addition, the uniform support in the record for this approach bolsters the Commission's confidence that this approach is in the public interest. Because of this licensing approach, the burden for small entities is minimized and provides them with more accessibility to participate in this industry.

*Interim Access Mechanism Registration.* The Commission adopts an IAM to enable NNA entities to begin operations in the band during the interim period before the DFMS is operational. IAM registration is accomplished by completing an on-line NNA registration form with the Commission, which requires basic information and certifications. The information required for registration is straightforward, which lessens the administrative burden on small entities. To further minimize the burden on registering entities, there will be no financial cost for

this registration process. Once the registration form is completed and submitted, a confirmation number of their registration will be provided and NNA operations can commence immediately. Therefore, there is not a significant impact on small entities that seek to register. While there is an added administrative burden to register with the Commission during the IAM period, the cost of this added burden is balanced by the ability of UAS operators, including small entities, to gain immediate access to the 5030-5091 MHz band.

*Equipment Authorization.* The Commission adopts equipment authorization requirements similar to those under §§ 87.145 and 87.147 of the Commission's rules to all equipment intended for use in the 5030-5091 MHz band. Section 87.145 requires that each transmitter must be certified for use in the relevant service, and section 87.147 establishes a specific equipment authorization for part 87 equipment, which for the frequencies in the 5030-5091 MHz band among others, requires coordination with the FAA. The Commission adopts these requirements that transmitters be certified for use in the relevant service through compliance with OET procedures for equipment authorization under part 2, subpart J of the Commission's rules and that the FAA is notified when filing the requisite application. Applying this approach to UAS equipment will ensure that necessary coordination occurs with the FAA, and that equipment authorizations by the Commission and the FAA are consistent and that all equipment approved for use in the band meet both agencies' requirements. The entities required to comply with equipment authorization will primarily be equipment manufacturers, some of which include small entities. However, the Commission balances the regulatory burden imposed by these equipment authorization requirements with the importance of a process that will aid the FAA's aviation safety responsibilities and help protect against harmful interference and believes that these requirements do not impose a significant burden on small entities. Furthermore, all entities—including small entities—will use and, thus, need to certify that they are using authorized equipment, but most small UAS entities will not be directly affected by these requirements beyond using the equipment.

## **ORDERING CLAUSES**

Accordingly, IT IS ORDERED, pursuant to sections 1, 4, 301, 303, 307, and 310 of the Communications Act of 1934, as amended, 47 U.S.C. 151, 154, 301, 303, 307, and 310, that the *Report and Order* IS HEREBY ADOPTED.

IT IS FURTHER ORDERED that the *Report and Order*, including the rules as set forth in Appendix A, SHALL BE EFFECTIVE thirty (30) days after publication in the *Federal Register*, with the exception of §§ 88.27, 88.31, 88.33, 88.35, 88.111, 88.113, 88.115, 88.135, 88.137, and 88.141 of the Commission's rules, 47 CFR 88.27, 88.31, 88.33, 88.35, 88.111, 88.113, 88.115, 88.135, 88.137, 88.141, which may contain new or modified information collection requirements that require review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act and will take effect after the Wireless Telecommunications Bureau publishes a notice in the *Federal Register* announcing the completion of such review and the relevant effective date(s).

IT IS FURTHER ORDERED that the Office of the Secretary, Reference Information Center, SHALL SEND a copy of the *Report and Order*, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

IT IS FURTHER ORDERED that the Commission SHALL SEND a copy of the *Report and Order* in a report to be sent to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. 801(a)(1)(A).

### **List of Subjects**

#### **47 CFR Part 0**

Authority delegations (Government agencies), Organization and functions (Government agencies).

#### **47 CFR Part 1**

Administrative practice and procedure, Communications, Communications equipment, Radio, Reporting and recordkeeping requirements, Wireless radio services.

**47 CFR Part 2**

Communications equipment.

**47 CFR Part 87**

Communications equipment, Radio.

**47 CFR Part 88**

Communications, Communications equipment, Incorporation by reference, Radio, Reporting and recordkeeping requirements, Unmanned aircraft.

**47 CFR Part 95**

Communications equipment, Incorporation by reference, Radio, Telecommunications.  
Federal Communications Commission.

**Marlene Dortch,**

*Secretary.*

For the reasons discussed in the preamble, the Federal Communications Commission amends 47 CFR parts 0, 1, 2, 87, 95, and adds part 88, as follows:

## **PART 0 – COMMISSION ORGANIZATION**

1. The authority citation for part 0 continues to read as follows:

**Authority:** 47 U.S.C. 151, 154(i), 154(j), 155, 225, 409, and 1754, unless otherwise noted.

2. Amend § 0.241 by adding paragraphs (a)(1)(iii) and (m) to read as follows:

### **§ 0.241 Authority delegated.**

(a) \* \* \*

(1) \* \* \*

(iii) The Chief of the Office of Engineering and Technology is delegated authority, along with the Chief of the Wireless Telecommunications Bureau, by notice-and-comment rulemaking if required by statute or in the public interest, to issue an order amending rules in part 88 of this chapter that reference industry standards to specify revised versions of the standards. These delegations are limited to modifying rules to reference revisions to standards that are already in the rules and not to incorporate a new standard into the rules, and are limited to the approval of changes that do not raise major compliance issues.

\* \* \* \* \*

(m) The Chief of the Office of Engineering and Technology is delegated authority jointly with the Chief of the Wireless Telecommunications Bureau to administer the Dynamic Frequency Management System (DFMS) and DFMS Administrator functions set forth in part 88 of this chapter. The Chief is delegated authority to administer the process of DFMS Administrator approval in close consultation with the FAA and NTIA, including authority to develop specific methods that will be used to designate DFMS Administrators; to designate DFMS Administrators; to develop procedures that these DFMS Administrators will use to ensure compliance with the requirements for DFMS operation; and to make determinations regarding the continued acceptability of individual DFMS Administrators.

3. Amend § 0.331 by revising the introductory text of paragraph (d) and adding paragraph (j) to read as follows:

**§ 0.331 Authority delegated.**

\* \* \* \* \*

(d) *Authority concerning rulemaking proceedings.* The Chief, Wireless Telecommunications Bureau, shall not have the authority to act upon notices of proposed rulemaking and inquiry, final orders in rulemaking proceedings and inquiry proceedings, and reports arising from any of the foregoing except such orders involving ministerial conforming amendments to rule parts, or orders conforming any of the applicable rules to formally adopted international conventions or agreements where novel questions of fact, law, or policy are not involved. Orders conforming any of the applicable rules in part 17 of this chapter to rules formally adopted by the Federal Aviation Administration also need not be referred to the Commission if they do not involve novel questions of fact, law, or policy. In addition, revisions to the airport terminal use list in § 90.35(c)(61) of this chapter and revisions to the Government Radiolocation list in § 90.371(b) of this chapter need not be referred to the Commission. Adoption of certain technical standards applicable to hearing aid compatibility under § 20.19 of this chapter made together with Chief of the Office of Engineering and Technology, as specified in § 20.19(k) of this chapter, also need not be referred to the Commission. Adoption of amendments to rules in part 88 of this chapter by notice-and-comment rulemaking, along with the Chief of the Office of Engineering and Technology as specified in § 0.241(a)(1)(iii), that reference industry standards to specify revised versions of the standards, need not be referred to the Commission, however, these delegations are limited to modifying rules to reference revisions to standards that are already in the rules and not to incorporate a new standard into the rules, and are limited to the approval of changes that do not raise major compliance issues. Also, the addition of new Marine VHF frequency coordination committee(s) to § 80.514 of this chapter need not be referred to the Commission if they do not involve novel questions of fact, policy or law, as well as requests by the United

States Coast Guard to:

\* \* \* \* \*

(j) *Authority concerning the administration of dynamic frequency management systems.* The Chief of the Wireless Telecommunications Bureau is delegated authority jointly with the Chief of the Office of Engineering and Technology to administer the Dynamic Frequency Management System (DFMS) and DFMS Administrator functions set forth in part 88 of this chapter. The Chief is delegated authority to administer the process of DFMS Administrator approval in close consultation with the FAA and NTIA, including authority to develop specific methods that will be used to designate DFMS Administrators; to designate DFMS Administrators; to develop procedures that these DFMS Administrators will use to ensure compliance with the requirements for DFMS operation; and to make determinations regarding the continued acceptability of individual DFMS Administrators.

## **PART 1 – PRACTICE AND PROCEDURE**

4. The authority citation for part 1 continues to read as follows:

**Authority:** 47 U.S.C. chs. 2, 5, 9, 13; 28 U.S.C. 2461 note; 47 U.S.C. 1754, unless otherwise noted.

5. Revise §§ 1.901 and 1.902 to read as follows:

### **§ 1.901 Basis and purpose.**

The rules in this subpart are issued pursuant to the Communications Act of 1934, as amended, 47 U.S.C. 151 et seq. The purpose of the rules in this subpart is to establish the requirements and conditions under which entities may be licensed in the Wireless Radio Services as described in this part and in parts 13, 20, 22, 24, 27, 30, 74, 80, 87, 88, 90, 95, 96, 97, and 101 of this chapter.

### **§ 1.902 Scope.**

In case of any conflict between the rules set forth in this subpart and the rules set forth in parts 13, 20, 22, 24, 27, 30, 74, 80, 87, 88, 90, 95, 96, 97, and 101 of title 47, chapter I of the

Code of Federal Regulations, the rules in this part shall govern.

6. Amend § 1.907 by revising the definitions of “Private Wireless Services” and “Wireless Radio Services” to read as follows:

**§ 1.907 Definitions.**

\* \* \* \* \*

*Private Wireless Services.* Wireless Radio Services authorized by parts 80, 87, 88, 90, 95, 96, 97, and 101 of this chapter that are not Wireless Telecommunications Services, as defined in this part.

\* \* \* \* \*

*Wireless Radio Services.* All radio services authorized in parts 13, 20, 22, 24, 26, 27, 30, 74, 80, 87, 88, 90, 95, 96, 97 and 101 of this chapter, whether commercial or private in nature.

\* \* \* \* \*

7. Amend § 1.924 by adding paragraph (a)(4) to read as follows:

**§ 1.924 Quiet Zones.**

(a) \* \* \*

(4) Parties subject to subpart B of part 88 of this chapter shall follow the requirements of § 88.35 of this chapter instead of the requirements of paragraph (a) of this section.

\* \* \* \* \*

**PART 2 – FREQUENCY ALLOCATIONS AND RADIO TREATY MATTERS;  
GENERAL RULES AND REGULATIONS**

8. The authority citation for part 2 continues to read as follows:

**Authority:** 47 U.S.C. 154, 302a, 303, and 336, unless otherwise noted.

9. Amend § 2.1055 by revising paragraph (a)(2) to read as follows:

**§ 2.1055 Measurements required: Frequency stability.**

(a) \* \* \*

(2) From  $-20^{\circ}$  to  $+50^{\circ}$  centigrade for equipment to be licensed for use in the Maritime

Services under part 80 of this chapter, except for Class A, B, and S Emergency Position Indicating Radiobeacons (EPIRBS), and equipment to be licensed for use above 952 MHz at operational fixed stations in all services, stations in the Local Television Transmission Service and Point-to-Point Microwave Radio Service under part 21 of this chapter, equipment licensed for use aboard aircraft in the Aviation Services under part 87 of this chapter, uncrewed aircraft stations (as defined in § 88.5 of this chapter) in the Uncrewed Aircraft System Services under part 88 of this chapter, and equipment authorized for use in the Family Radio Service under part 95 of this chapter.

\* \* \* \* \*

## **PART 87 – AVIATION SERVICES**

10. The authority citation for part 87 continues to read as follows:

**Authority:** 47 U.S.C. 154, 303 and 307(e), unless otherwise noted.

11. Amend § 87.1 by revising paragraph (b) to read as follows:

### **§ 87.1 Basis and purpose.**

\* \* \* \* \*

(b) *Purpose.* Except as provided in part 88 of this chapter, this part states the conditions under which radio stations may be licensed and used in the aviation services. These rules do not govern U.S. Government radio stations.

12. Add part 88 to read as follows:

## **PART 88—UNCREWED AIRCRAFT SYSTEM SERVICES**

### **Subpart A—General Rules**

Sec.

88.1 Scope.

88.3 Application of other rule parts.

88.5 Definitions.

### **Subpart B—Non-Networked Access**

Sec.

88.25 Limitations on NNA communications.

88.27 Authorization.

88.29 Frequencies.

88.31 Non-networked access use.

88.33 Information requirements.

88.35 National radio quiet zone coordination.

**Subpart C—[Reserved]**

**Subpart D—Technical Requirements**

Sec.

- 88.101 Transmitter power.
- 88.103 Emissions bandwidth.
- 88.105 Emission mask.
- 88.107 Out-of-band emission limits.
- 88.109 Time division duplex requirement.
- 88.111 Certification required.
- 88.113 Authorization of equipment.
- 88.115 RF safety.
- 88.117 Incorporation by reference.

**Subpart E—Dynamic Frequency Management Systems**

Sec.

- 88.135 DFMS requirements.
- 88.137 DFMS administrators.
- 88.139 DFMS administrator fees.
- 88.141 Interim access mechanism.

**Authority:** 47 U.S.C. 154(i), 303, 307.

**Subpart A—General Rules**

**§ 88.1 Scope.**

This part sets forth the regulations governing the use of the 5030-5091 MHz band by Uncrewed Aircraft Systems.

**§ 88.3 Application of other rule parts.**

(a) Except as expressly provided under this part, part 87 of this chapter shall not apply to uncrewed aircraft systems communications in the 5030-5091 MHz band.

(b) Non-Networked Access (NNA) devices, as defined in this part, are considered part of the Citizens Band Radio Service, as defined in § 95.303 of this chapter. Except for the definitions of Citizens Band Radio Service and Uncrewed Aircraft System Services in § 95.303, the rules of part 95 of this chapter shall not apply to such devices.

**§ 88.5 Definitions.**

The following terms and definitions apply only to the rules in this part.

*Control and Non-payload Communications (CNPC).* Any transmission that is sent between the UA component and the UAS ground station of the UAS and that supports the safety or regularity of the UA's flight.

*Dynamic Frequency Management System (DFMS).* A frequency coordination system operating in the 5030-5091 MHz band that:

- (1) Is highly automated and capable of providing rapid responses to frequency assignment requests from registered NNA operators, and
- (2) In response to such requests, is capable of assigning to the requesting operator temporary protected use of certain frequencies for a particular geographic area and time period tailored to the operator's submitted operation, to the extent such frequencies are available.

*Dynamic Frequency Management System (DFMS) Administrator.* An entity authorized by the Commission to operate a DFMS in accordance with the rules and procedures set forth in subpart E of this part.

*Interim Access Mechanism (IAM).* A process by which non-networked access users will be allowed temporary, short-term access to 5040-5060 MHz frequencies in the period before the first DFMS is approved and placed into operation.

*Non-Networked Access (NNA).* Temporary, interference-protected access to the 5030-5091 MHz band consistent with subpart B of this part.

*Non-Networked Access (NNA) station.* An uncrewed aircraft system ground station or uncrewed aircraft station authorized under this part and designed to communicate using NNA assignments consistent with subparts B and D.

*Non-Networked Access (NNA) user.* An authorized user of spectrum in the 5030-5091 MHz band operating on an NNA basis, as set forth in subpart B.

*Payload.* Information that is sent to or from a UA component to achieve mission objectives and is not CNPC.

*Uncrewed Aircraft (UA).* An aircraft operated without the possibility of direct human intervention from within or on the aircraft.

*Uncrewed Aircraft Station.* A mobile station authorized under this part and located on board a UA.

*Uncrewed Aircraft System (UAS).* A UA and its associated elements (including an uncrewed aircraft station, communication links, and the components not on board the UA that control the UA) that are required for the safe and efficient operation of the UA in the airspace of the United States.

*Uncrewed Aircraft System (UAS) Ground Station.* Radio communications equipment on the ground used to maintain control over or otherwise communicate with a UA.

## **Subpart B – Non-Networked Access**

### **§ 88.25 Limitations on NNA communications.**

(a) Transmissions over an NNA assignment are limited to CNPC.

(b) UAS ground stations may be fixed or mobile, but mobile ground stations cannot be used while in motion or at locations other than those approved under the applicable frequency assignment.

### **§ 88.27 Authorization.**

(a) Any entity, other than those precluded by section 310 of the Communications Act of 1934, as amended, 47 U.S.C. 310, and that otherwise meets the technical, financial, character, and citizenship qualifications that the Commission may require in accordance with such Act, is eligible to be an NNA user and operate NNA stations under this part.

(b) NNA users are licensed by the rules in this part and do not need an individual license issued by the Commission. Even though an individual license is not required, an NNA user licensed by the rules in this part must comply with all applicable operating requirements, procedures, and technical requirements found in this part.

(c) To transmit in the frequencies of the 5030-5091 MHz band designated for NNA operations, an NNA user must register with a DFMS and comply with its instructions and the rules in this part.

(d) Registered NNA users may transmit in the frequencies of the 5030-5091 MHz band designated for NNA operations only using NNA stations compliant with the rules of this part,

and only pursuant to and consistent with the terms of a frequency assignment from a Commission-approved DFMS.

**§ 88.29 Frequencies.**

(a) The 5040-5050 MHz band is designated to NNA users for CNPC use.

(b) In the period prior to the approval and commencement of operation by the first DFMS administrator, NNA users may access the 5040-5060 MHz band pursuant to the IAM process, as set forth in § 88.141.

**§ 88.31 Non-networked access.**

(a) Parties registered with a DFMS may submit a request to the DFMS for temporary frequency assignments for CNPC limited to the duration and geographic coverage necessary to support a single submitted UAS flight. Requests may also be made either prior to or during the relevant operation to modify an assignment. Such requests must be made to the same DFMS responsible for the original assignment.

(b) If frequencies meeting the request are available, the DFMS shall assign them on an exclusive but temporary basis. The scope of the assignment shall be tailored in both duration and geographic coverage to ensure interference-free communications for the entire submitted UAS flight.

(c) When registering with or using the services of a DFMS, a party shall comply with all DFMS Administrator instructions, including those regarding registration process and procedures, requests and other submissions to the DFMS, and operational use of NNA assignments.

(d) UAS operations using NNA assignments within the National Radio Quiet Zone (NRQZ) are prohibited without the prior coordination with the NRQZ administrator required under § 88.35. Consistent with § 2.106(c)(211) of this chapter, NNA users should take all practicable steps to protect radio astronomy in the 4990-5000 MHz band, subject to § 2.106(c)(74) of this chapter.

(e) Any UAS ground station using an NNA assignment to support a UAS flight, or proxy

software acting on the ground station's behalf, must be capable of communicating with the assigning DFMS to achieve the following:

(1) confirm that all NNA stations used in the operation, including any UAS ground station or airborne station used in the flight, are programmed to limit communications in the 5030-5091 MHz band, during the period of the frequency assignment, to the specific frequencies assigned by the DFMS and in accordance with the other terms of the assignment; and

(2) send updates on flight status when a UA has launched and when it has landed.

### **§ 88.33 Information requirements.**

(a) Information submitted to a DFMS with registration or a frequency assignment request must be accurate, complete, and made in good faith. Registration information must include a party's legal name and contact information, as well as other information required by the DFMS.

(b) Parties must keep registration information up to date, and must keep frequency assignment request information up to date until the scheduled time of the operation.

### **§ 88.35 National radio quiet zone coordination.**

(a) Except as provided in paragraphs (a)(1) and (2) of this section, parties planning to operate an NNA station within the area bounded by N 39°15'0.4" on the north, W 78°29'59.0" on the east, N 37°30'0.4" on the south, and W 80°29'59.2" on the west must notify the National Radio Quiet Zone Administrator (NRQZ Administrator) in writing at Post Office Box No. 2, Green Bank, West Virginia 24944, or by email to [nrqz@nrao.edu](mailto:nrqz@nrao.edu), of the technical details of the proposed operation. The notification must include the geographical coordinates of ground station antenna locations, associated ground station antenna height, antenna directivity (if any), the maximum airborne station altitude, the maximum airborne station flight altitude (MSL or AGL), the frequencies, the emission type, and power.

(1) If an operation or revision of an operation is within the scope, including any applicable conditions, of a previously granted approval from the NRQZ Administrator, parties need not provide notification of the operation or revision to the NRQZ Administrator, but must

submit the approval with any frequency assignment request relying on this exception.

(2) If the NRQZ Administrator establishes criteria for NNA operations in the NRQZ that do not require notification to the NRQZ Administrator, and an operation or revision of an operation is within the scope of such criteria, a party need not provide notification of the operation or revision to the NRQZ Administrator, but, when submitting their request, must certify that their request meets the criteria for NNA operations in the NRQZ that do not require notification to the NRQZ Administrator and provide any additional supporting documentation required by the DFMS.

(3) When a request for concurrence is submitted to the FAA under the Interim Access Mechanism provided under § 88.141, the request must state the date that notification in accordance with paragraph (a) of this section was made or provide an approval from the NRQZ Administrator for operations within the NRQZ or portions thereof along with the maximum operating altitude allowed.

(b) When a request for frequency assignment involving an NNA station subject to paragraph (a) of this section is submitted to a DFMS, the required notification must be made prior to or simultaneously with the request. The request must state the date that notification in accordance with paragraph (a) of this section was made. After receipt of such a request, the DFMS shall allow a period of 20 days for objections in response to the notifications indicated. If a DFMS determines that a request is subject to an exception to notification under paragraphs (a)(1) or (2) of this section, it shall process the request without waiting the 20-day period. In instances in which notification has been made to the NRQZ Administrator prior to the submission of the request, the requesting party must also provide notice to the NRQZ Administrator upon actual submission of the request with the DFMS, specifying which DFMS has received the request. Such notice will be made simultaneous with the submission of the request and shall comply with the requirements of paragraph (a) of this section.

(c) If an objection from the NRQZ Administrator is received by a DFMS during the 20-

day period specified in paragraph (b) of this section, the DFMS shall forward the record, including the assignment request, associated NNA station details, and objection, to the FCC. The FCC will, after consideration of the record, take whatever action is deemed appropriate.

### **Subpart C—[Reserved]**

### **Subpart D—Technical Requirements**

#### **§ 88.101 Transmitter power.**

Transmitters operating in the 5030-5091 MHz band must comply with the transmitter output power specified in technical standard RTCA DO-362A (incorporated by reference, see § 88.117) section 2.2.1.6.1 and associated subsections.

#### **§ 88.103 Emissions bandwidth.**

The authorized bandwidth is the maximum occupied bandwidth authorized to be used by a station. Transmitters operating in the 5030-5091 MHz band must comply with the channel width requirements, channel placement requirements, tunability requirements, and non-video channel bandwidth limitations specified in technical standard RTCA DO-362A (incorporated by reference, see § 88.117) sections 2.2.1.5.2, 2.2.1.5.3, 2.2.1.5.4, and 2.2.1.5.6, respectively.

#### **§ 88.105 Emission mask.**

Transmitters operating in the 5030-5091 MHz band must comply with the ARS and GRS radio transmitter power spectral density (PSD) limits specified in technical standard RTCA DO-362A (incorporated by reference, see § 88.117) section 2.2.1.6.2.1.

#### **§ 88.107 Out-of-band emission limits.**

Transmitters operating in the 5030-5091 MHz band must comply with the out-of-band emission limits specified in technical standard RTCA DO-362A (incorporated by reference, see § 88.117) section 2.2.1.8.2 and associated subsections. On any frequency outside the 5030-5091 MHz band that is not addressed by RTCA DO-362A section 2.2.1.8.2 and associated subsections, the power of any emission, as measured over a 1 megahertz resolution bandwidth, shall be attenuated outside the band below the transmitter power (P) by at least  $43 + 10\log(P)$  dB.

### **§ 88.109 Time division duplex requirement.**

Transmitters operating in the 5030-5091 MHz band must comply with the time division duplex (TDD) frame structure and timing accuracy requirements specified in technical standard RTCA DO-362A (incorporated by reference, see § 88.117) sections 2.2.1.3 and 2.2.1.3.1.

### **§ 88.111 Certification required.**

Each transmitter utilized for operation under this part and each transmitter marketed as set forth in § 2.803 of this chapter must be certified by the Commission for use in part 88 services following the procedures set forth in part 2, subpart J of this chapter.

### **§ 88.113 Authorization of equipment.**

An applicant for certification of equipment intended for transmission in the 5030-5091 MHz band must notify the FAA of the filing of a certification application. The letter of notification must be mailed to: FAA, Spectrum Engineering Service Group, AJW-1900, 800 Independence Ave., SW, Washington, DC 20591 prior to the filing of the application with the Commission.

(a) The notification letter must describe the equipment, and give the manufacturer's identification, antenna characteristics, rated output power, emission type and characteristics, the frequency or frequencies of operation, and essential receiver characteristics if protection is required.

(b) The certification application must include a copy of the notification letter to the FAA. The Commission will not act until it receives the FAA's determination regarding whether it objects to the application for equipment authorization. The FAA should mail its determination to: Office of Engineering and Technology Laboratory Division, Equipment Authorization and Compliance Branch, 7435 Oakland Mills Rd., Columbia, MD 21046. The Commission will consider the FAA determination before taking final action on the application.

### **§ 88.115 RF safety.**

Licensees and manufacturers are subject to the radio frequency radiation exposure

requirements specified in §§ 1.1307(b), 1.1310, 2.1091, and 2.1093 of this chapter, as appropriate. Applications for equipment authorization of mobile or portable devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions and technical information showing the basis for this statement must be submitted to the Commission upon request.

**§ 88.117 Incorporation by reference.**

The standards referenced in this section are incorporated by reference into this subpart with the approval of the Director of the Federal Register in accordance with 5 U.S.C. 552(a) and 1 CFR part 51. The approved material is available for inspection at the Federal Communications Commission (FCC) and at the National Archives and Records Administration (NARA). Contact the FCC at: 45 L Street NE, Reference Information Center, Room 1.150, Washington, DC 20554; phone: (202) 418-0270. For information on the availability of this material at NARA, email [fedreg.legal@nara.gov](mailto:fedreg.legal@nara.gov) or go to [www.archives.gov/federal-register/cfr/ibr-locations](http://www.archives.gov/federal-register/cfr/ibr-locations). The material may be obtained from RTCA, Inc., 1150 18th Street NW, Suite 910, Washington, DC 20036; phone: 202-833-9339; email: [info@rtca.org](mailto:info@rtca.org); website: <http://RTCA.org>.

(a) RTCA-DO-362A, Command and Control (C2) Data Link Minimum Operational Performance Standards (MOPS) (Terrestrial), dated December 17, 2020.

(b) [Reserved]

**Subpart E—Dynamic Frequency Management Systems**

**§ 88.135 DFMS requirements.**

(a) A DFMS must provide a process for NNA users to register with the system for the purpose of submitting frequency assignment requests and obtaining frequency assignments.

(b) All DFMSs must require the same registration and frequency assignment request information. Registration shall require, among other information, the registrant's legal name and contact information.

(c) A DFMS must be capable of processing frequency assignment requests nationwide

and across the entire 5030-5091 MHz band. However, a DFMS may only grant assignments for spectrum within those frequencies specified under § 88.29(a).

(d) In response to a frequency assignment request from a registered party, a DFMS shall determine and provide, through a process that is highly automated and capable of rapid responses to frequency assignment requests, an assignment of frequencies for a particular geographic area and time period tailored to the submitted UAS flight, to the extent that frequencies are available to meet the request and grant of the assignment is otherwise consistent with this part.

Assignments must provide protected access to frequencies over a duration and geographic area sufficient to cover and support the entire UAS flight. Assignments may specify channels and maximum transmit power level.

(e) A DFMS may not terminate an assignment while a flight is ongoing or modify the assignment during this time unless pursuant to a revision request from the assignee.

(f) Assignments must account for the need to protect other authorized operations.

(g) Models and methodologies for interference determinations used by a DFMS should be both effective in avoiding harmful interference and consistent between different DFMSs.

(h) For each frequency assignment request, a DFMS must confirm through certifications in the frequency assignment request process that the requesting party has flight authorization from the FAA to cover the flight associated with the frequency assignment request, and that any remote pilots that will be involved in the flight have all necessary FAA remote pilot authorization, to the extent such authorization is required. Any party challenging a DFMS action with regard to this requirement or otherwise seeking a Commission determination regarding a party's FAA authorization in this context must submit, with its filing to the Commission, a determination from the FAA regarding whether the NNA frequency assignee in question has the relevant authorization under FAA rules and requirements.

(i) A DFMS must be capable of responding to in-flight revision requests.

(j) A DFMS must be capable of communicating directly with a UAS ground station

operating in the NNA spectrum, or with proxy software acting on the ground station's behalf, to achieve the following:

(1) ensure that all NNA stations used in an operation, including any ground or airborne station used in the flight, are programmed to limit communications in the 5030-5091 MHz band, during the period of the frequency assignment, to the specific frequencies assigned by the DFMS and in accordance with the other terms of the assignment; and

(2) receive updates on flight status when a UA has launched and when it has landed.

(k) Frequency assignment requests may not be approved:

(1) for periods commencing on or after eight calendar days after the date on which the request is submitted, except to the extent that lack of frequency availability in that time frame or the coordination requirement under § 88.35 justify a later assignment; or

(2) for an operation lasting more than 24 hours.

(l) A DFMS must communicate and coordinate with other DFMSs as necessary to ensure consistent data and assignments, the safe and robust operation of authorized services, and compliance with the rules.

(m) A DFMS must employ protocols and procedures to ensure that all communications between the DFMS and users or NNA stations in connection with a DFMS's NNA functions are secure and that unauthorized parties cannot access, shut down, or alter the DFMS or its stored information.

(n) Communications between users and a DFMS and between different DFMSs must be secure to prevent corruption or unauthorized interception of data. A DFMS must be protected from unauthorized data input or alteration of stored data.

(o) A DFMS must verify that the NNA stations to be used in operations are FCC-certified devices and must not provide assignments to an uncertified device.

(p) A DFMS must retain information on, and enforce, exclusion zones sufficient to protect Microwave Landing Systems (MLS) in the 5030-5091 MHz band.

(q) A DFMS shall maintain all records for at least 60 months, including but not limited to date, time, and requester identification records for all requests for, approval of, denial of, or termination of approval for all assignments of frequencies or revisions of such assignments, and all certifications submitted in connection with such requests.

(r) A DFMS must be capable of receiving reports of interference and requests for additional protection from MLS users in the 5030-5091 MHz band or authorized users in adjacent bands and promptly address interference issues.

(s) A DFMS must implement § 88.35 in its frequency assignment process.

(t) A DFMS must implement the terms of any international agreements with Canada and Mexico adopted to address coordination and compatibility of near-border UAS operations in the 5030-5091 MHz band.

(u) Except as provided under paragraphs (v) and (w) of this section, a DFMS must process frequency assignment requests on a non-discriminatory first-come-first-served manner.

(v) In the event of emergencies, a DFMS should, to the extent feasible and consistent with the interests of aviation safety, prioritize requests from public safety entities. Prioritization may not terminate or modify an NNA user's assignment while the assignment is in use during a UAS flight.

(w) During extended periods of congestion, the DFMS should prioritize requests involving flights relying on a single ground station over requests that rely on multiple stations, to the extent feasible and consistent with the interests of aviation safety.

(x) A DFMS must immediately notify the National Science Foundation, Division of Astronomical Sciences, Electromagnetic Spectrum Management Unit, by email at [esm@nsf.gov](mailto:esm@nsf.gov) when a request for frequency assignment is approved that will support operation of a UAS within 25 miles of a radio astronomy site listed in table 1 to this section. Notification must include the operation details.

**Table 1 to § 88.135.**

Allen Telescope Array, Hat Creek, CA	Rectangle between latitudes 40° 00' N and 42° 00' N and between longitudes 120° 15' W and 122° 15' W.	
NASA Goldstone Deep Space Communications Complex, Goldstone, CA	80 kilometers (50 mile) radius centered on 35° 20' N, 116° 53' W.	
National Astronomy and Ionosphere Center, Arecibo, PR	Rectangle between latitudes 17° 30' N and 19° 00' N and between longitudes 65° 10' W and 68° 00' W.	
National Radio Astronomy Observatory, Socorro, NM	Rectangle between latitudes 32° 30' N and 35° 30' N and between longitudes 106° 00' W and 109° 00' W.	
National Radio Astronomy Observatory, Green Bank, WV	Rectangle between latitudes 37° 30' N and 39° 15' N and between longitudes 78° 30' W and 80° 30' W.	
National Radio Astronomy Observatory, Very Long Baseline Array Stations	80 kilometers radius centered on:	
	North Latitude	West Longitude
Brewster, WA	48° 08'	119° 41'
Fort Davis, TX	30° 38'	103° 57'
Hancock, NH	42° 56'	71° 59'
Kitt Peak, AZ	31° 57'	111° 37'
Los Alamos, NM	35° 47'	106° 15'
Mauna Kea, HI	19° 48'	155° 27'
North Liberty, IA	41° 46'	91° 34'
Owens Valley, CA	37° 14'	118° 17'

Pie Town, NM	34° 18'	108° 07'
Saint Croix, VI	17° 45'	64° 35'
Owens Valley Radio Observatory, Big Pine, CA	Two contiguous rectangles, one between latitudes 36° 00' N and 37° 00' N and between longitudes 117° 40'W and 118° 30'W, and the second between latitudes 37° 00' N and 38° 00' N and between longitudes 118° 00'W and 118° 50' W.	

**§ 88.137 DFMS administrators.**

The Commission will approve one or more DFMS Administrators to manage access to the 5030-5091 MHz band on a nationwide basis as specified in § 88.135. Each DFMS Administrator is responsible for ensuring that its DFMS is fully functional and meets all the rule requirements in this part and providing services to NNA users in the Uncrewed Aircraft System Services. Each DFMS Administrator approved by the Commission:

- (a) Must operate a DFMS consistent with the rules of this part.
- (b) Must establish and follow protocols and procedures to ensure compliance with the rules set forth in this part.
- (c) Must provide service for a ten-year term. This term may be renewed at the Commission's discretion.
- (d) Must securely transfer all the information in the DFMS to another approved entity in the event it does not continue as the DFMS Administrator at the end of its term. It may charge a reasonable price for such conveyance.
- (e) Must cooperate with other approved DFMS Administrators to develop a standardized process for coordinating operations, avoiding any conflicting assignments, and maximizing shared use of available frequencies.
- (f) Must coordinate with other DFMS Administrators including sharing assignment and

other information, facilitating non-interference to and from operations relying on assignments from other DFMSs, and other functions necessary to ensure that use of available spectrum is safe and efficient and consistent with this part.

(g) Must ensure that the DFMS shall be available at all times to immediately respond to requests from authorized Commission personnel for any and all information stored or retained by the DFMS, including through either or both provision of the information or provision of direct access to the DFMS database, at the discretion of the Commission.

(h) Must establish and follow protocols to comply with enforcement instructions from the Commission.

(i) May implement such reasonable limits on requests as are necessary to prevent the hoarding, warehousing, monopolization, or otherwise excessive reservation of NNA spectrum by a particular party.

#### **§ 88.139 DFMS administrator fees.**

(a) A DFMS Administrator may charge users a reasonable fee for services provided, including usage-based fees for frequency assignments.

(b) The Commission, upon request, will review the fees and can require changes in those fees if they are found to be excessive.

#### **§ 88.141 Interim access mechanism.**

(a) *IAM Period.* In the period prior to the approval and commencement of operation by the first DFMS administrator, NNA users may access the 5040-5060 MHz band for NNA communications pursuant to the IAM. After the date on which the first DFMS administrator commences operations, NNA communications will be restricted to the 5040-5050 MHz band, as specified in § 88.29(a). After such date, any existing IAM frequency assignments terminates and NNA users may not seek or use frequency assignments pursuant to the IAM. NNA users will be required to request frequency assignments from the DFMS administrator once the DFMS is operational.

(b) *IAM Process*. NNA users seeking to transmit in the band must first obtain concurrence from the FAA for the requested use, and must ensure that any such operations comply with the scope of approval, terms, conditions, and restrictions of the FAA concurrence. Upon receipt of FAA concurrence, NNA users must submit to the FCC an online NNA registration form regarding the requested use, certifying that:

(1) They have complied with the FAA concurrence process;

(2) The operation is in compliance with the Commission's NNA rules and technical requirements;

(3) All equipment utilized in the NNA operation meets equipment certification requirements; and

(4) Their IAM frequency assignment terminates immediately in the event a DFMS becomes operational prior to the end of the IAM frequency assignment.

## **PART 95 – PERSONAL RADIO SERVICES**

13. The authority citation for part 95 continues to read as follows:

**Authority:** 47 U.S.C. 154, 303, 307.

14. Amend § 95.303 by adding the definition of “*Uncrewed Aircraft System Services*,” in alphabetical order, to read as follows:

### **§ 95.303 Definitions.**

\* \* \* \* \*

*Uncrewed Aircraft System Services*. The rules for these services, including technical rules, are contained in part 88 of this chapter. Only NNA stations authorized on a Non-Networked Access basis, as those terms are defined in § 88.3 of this chapter, are considered part of the Citizens Band Radio Services.

\* \* \* \* \*