November 29, 2021

VIA FDMS

U.S. Department of Transportation
Docket Management System, Docket Operations
West Building Ground Floor, Room W12-140,
1200 New Jersey Avenue, SE
Washington, DC 20590

Re: *Petition to Amend Exemptions 18602 and 18601 to add type certificate candidate drone and to modify certain conditions and limitations*

To Whom It May Concern:

Pursuant to 14 C.F.R. Part 11, Amazon.com Services LLC dba Amazon Prime Air respectfully submits this application for amendments to Exemptions 18602 and 18601 (Exemptions) to cover the second generation of its MK27 drone system.

Amazon Prime Air has operated the MK27 drone system[1] under its Part 135 air carrier certificate for over a year,[2] conducting research on how the equipment and our operations can be improved to better serve our customers. These efforts have resulted in the development of the second-generation MK27-2 drone system, which includes enhanced perception and the ability to maintain controlled flight after losing a propulsion unit. The MK27-2 can be operated safely without many of the conditions and limitations the Exemptions placed on the original MK27. The MK27-2 configuration is also the drone for which Prime Air is seeking type certification.[3] To support the next steps in safely bringing drone delivery to our customers, Amazon respectfully requests that the FAA amend the Exemptions to cover the MK27-2 drone system and modify their conditions and limitations (C&L) to reflect the upgraded capabilities and enhanced safety of the MK27-2.

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[1] Amazon Prime Air recognizes that many of the laws and FAA regulations pertaining to drones use the phrases "unmanned aircraft system" and "unmanned aircraft". Amazon Prime Air will not use those terms and instead will use the non-gendered terms, "drone system" and "drone," respectively, to foster inclusion in the drone industry and support FAA's efforts to adopt inclusive language. FAA, *Notice of Public Meeting* (Inclusive Language Summit), 86 FR 59266 (Oct. 26, 2021); FAA Drone Advisory Committee, *FAA Gender-Neutral Language for the Drone Community* (June 2021), available at https://www.faa.gov/uas/programs_partnerships/advanced_aviation_advisory_committee/previous_dac_meetings_and_materials/media/DAC_Public_eBook_06_23_2021.pdf.

[2] Air Carrier Certificate 4MZA227Q.

[3] Type Certificate Project TC16899LA-R.

I. Background

Amazon Prime Air has invested extensively in research and development, worked closely with the FAA on our testing and certification efforts, collaborated with industry stakeholders to establish global standards and trial new technologies (e.g., airspace integration tools), and taken a long-term view focused on safely bringing Prime Air drone deliveries to our customers. We began with a performance and autonomy-based approach that worked backwards from three concurrent goals: (1) develop a system that safely and efficiently meets our customers' needs; (2) design our drone to be highly autonomous and independently safe; and (3) enable safe, automated integration into the National Airspace System (NAS). With our system engineering approach, Prime Air controls every aspect of the design, manufacturing, hardware and software development, engineering, testing, operations, and maintenance for all of our drone systems. This multi-year effort yielded the drone that we have been using for Prime Air's initial Part 135 air carrier operations, the MK27.

Since obtaining our Section 44807 exemption (Exemption 18602) and our operating exemption (Exemption 18601) in August 2020,[4] Amazon Prime Air has safely conducted thousands of successful Part 135 operations using its MK27 drone. We have taken the lessons learned from these operations and combined them with our relentless pursuit of technological innovation to develop substantial upgrades and safety enhancements to the original MK27 and its operating procedures. As a result of these efforts, a number of C&Ls in the Exemptions have become superseded or obsolete with respect to the MK27-2.

II. Amazon Prime Air MK27-2 Drone and Concept of Operations

The MK27-2 is an Amazon-designed fixed-wing aircraft capable of VTOL and wing-borne flight. The original MK27 will be replaced by the improved MK27-2, which is the model for which Amazon is pursuing type certification. Like the first iteration of the MK27, the MK27-2 is a battery powered, staggered tandem wing, hexagonal-shaped composite airframe with six motors. The drone climbs and descends vertically and then cruises on wing borne flight using control surfaces for additional roll, pitch, and yaw control. Like the original MK27, it also has an onboard health monitoring system that enacts a contingency to return the drone to the Amazon facility or land at a suitable location in the event of an off-nominal condition.

The MK27-2 features three key enhancements. First, the drone has the ability to maintain controlled flight along its pre-planned route and transition between

[4] *In the Matter of the Petition of Amazon Prime Air*, Grant of Exemption No. 18602 (Aug. 27, 2020), Docket FAA-2019-0622 ("Exemption No. 18602"); *In the Matter of the Petition of Amazon Prime Air*, Grant of Exemption No. 18601 (Aug. 27, 2020), Docket FAA-2019-00573 ("Exemption No. 18601").

horizontal and VTOL flight after losing a propulsion unit. If the MK27-2 experiences the loss of a propulsion unit, it will enact one of two contingencies—return home or safely land—depending on when it experiences the loss of a propulsion unit and its health state. Second, the MK27-2's enhanced perception system can detect whether people or obstacles are below it during delivery or landing and enact the appropriate contingency response. If the drone detects a person or obstacle in the delivery area or cannot ascertain a clear delivery area, it immediately aborts the delivery mission and returns home. If the drone is commanded to urgent land, either by the operator in command[5] (OIC) or the onboard health monitoring system, it navigates to an area along its pre-planned route that is free of structures and other obstacles and then searches for and selects the best landing location, maximizing distance from humans and obstacles. Both of these enhancements have been validated through flight test and simulation. Third, Amazon Prime Air has incorporated part upgrades to improve the MK27-2's service reliability.

MK27-2

These enhancements allow the MK27-2 to operate safely without a Flight Termination System (FTS). The original MK27 had an independent FTS that allowed the Safety Officer to immediately terminate the drone's flight in the event of off-nominal behavior.[6] In addition to the drone's ability to (1) autonomously enact the urgent land contingency if its health monitoring system detects an issue, (2) maintain controlled flight after losing a propulsion unit, and (3) find a safe landing area, the OIC can command the drone to land in the event of off-nominal behavior, including a departure from the drone's planned route. FTS has been removed from the MK27-2 because the drone's capabilities have rendered it unnecessary.

Further, the upgraded perception system supports safe delivery operations in closer proximity to structures, thereby allowing the drone to reach more configurations of customer locations while ensuring that no humans or structures are at risk.

[5] Prime Air recognizes that the FAA uses the term "pilot" to refer to the individual operating a drone. However, Prime Air uses the term "operator" because it more accurately describes the limited role of the individual responsible for launching Prime Air's highly autonomous, independently safe drones.

[6] Exemption No. 18601, C&L 39; Exemption No. 18602, C&L 27.

The MK27-2's capabilities allow us to ensure the safety of our operations while reducing the required crew to the following three positions: OIC, Visual Observer (VO), and Autonomous Vehicle Assistant (AVA). The MK27-2 crew changes include:

- Eliminating the Ground Station Operator (GSO) position. During operation of the original MK27, the GSO relayed the drone's status to the OIC and executed drone commands at the OIC's instruction.[7] While operating the MK27-2, the OIC will be able to observe the drone's health status and enter commands directly at the ground control station, rendering the GSO position unnecessary.

- Eliminating the Aircraft Observer (AO) position. The AO position was created to provide an additional observer to identify and report to the OIC any off-nominal behavior of the original MK27.[8] The MK27-2's capabilities render the AO position unnecessary.

- Eliminating the Backyard Safety Officer (BYSO) position. The BYSO position has been eliminated because the improved perception system and safety features of the MK27-2 have rendered it redundant. During operations with the original MK27, the BYSO was present to activate the FTS or request the OIC command "urgent land" in the event an off-nominal situation impacted the original MK27's ability to complete the delivery and return home.[9] The MK27-2's capabilities obviate the need for this position.
- Removing the Safety Officer (SO) from the required flight crew and changing the SO duties. Originally the SO stationed at the Amazon Prime Air facility was responsible for operating the FTS at the takeoff and landing site.[10] That function is no longer needed because the FTS will be removed. Although the SO will no longer be a required crew position, Prime Air will continue to use a SO for MK27-2 operations. The SO will now support multiple flight operations, continuing to ensure that Prime Air's operational safety procedures are followed.
- Changing the title of Flight Assistant (FA) to AVA. This change is not substantive, and the AVA completes all of the duties that had been assigned to the FA for the original MK27.[11]

Amazon Prime Air has built upon its original customer delivery Concept of Operations—ultrafast delivery of Amazon orders to Amazon customers—and incrementally expanded the scope of its operations by implementing the

[7] Exemption No. 18601, C&L 19.

[8] Exemption No. 18601, C&L 45.

[9] Exemption No. 18601, C&L 37.

[10] Exemption No. 18601, C&L 37.

[11] Exemption No. 18601, at 3.

enhancements described above.[12] All delivery operations will be conducted under Prime Air's existing Part 135 air carrier certificate and otherwise in accordance with the Exemptions' C&Ls.

III. Requested Amendments

Amazon Prime Air seeks to amend the Exemptions to add the MK27-2 and revise the C&Ls that have been rendered obsolete by the MK27-2's capabilities. In support of this application, Amazon will submit updated versions of the following MK27-2 documents under separate cover on a confidential basis (Supporting Documents):[13]

- Prime Air General Operations Manual (GOM);
- Prime Air General Maintenance Manual (GMM);
- Prime Air Flight Operations Training Manual (FOTM);
- Maintenance Operations Training Manual (MOTM);
- Prime Air MK27-2 Aircraft Flight Manual (AFM); and
- Prime Air MK27-2 Aircraft Maintenance Manual (AMM).

A. Amendments to Exemption 18602

Because MK27-2 operations "do not create a hazard to users of the national airspace system or the public,"[14] Prime Air requests that the MK27-2 be added to Exemption 18602 and that the administrative amendments to Exemption 18602's C&Ls set forth in Appendix A be made to reflect its addition. Prime Air also requests the following amendments to Exemption No. 18602's C&Ls.

1. Remove 100-foot perimeter from takeoff, landing, and delivery points

C&L	Current C&L	Requested Revision
8	Amazon must designate a perimeter with a minimum 100 foot radius centered at the takeoff, landing and delivery points. Amazon must ensure that no person is inside the perimeter(s) during takeoff, landing and delivery.	*Delete C&L*

[12] *See* Amazon Prime Air Petition for Exemption Under 49 U.S.C. § 44807 and 14 C.F.R. Parts 61, 91, and 135, Section IV (July 16, 2019), Docket FAA-2019-00573.

[13] The Supporting Documents are being submitted on a confidential basis pursuant to 14 C.F.R. § 11.35(b) because they contain confidential commercial and proprietary information that would materially harm Amazon's competitive position if the information was publicly disclosed. The information contained in this material is not generally available to the public, is commercially sensitive, confidential, and proprietary, and is protected from release under the Freedom of Information Act, 5 U.S.C. § 552, *et seq*.

[14] 49 U.S.C. § 44807(b)(1).

The MK27-2's capabilities make a designated minimum perimeter unnecessary to ensure the safety of operations. Prime Air crew will not approach a drone as it takes off or lands, and the drone will safely abort a delivery if people enter the delivery area.

2. Revise the configuration control document requirement to incorporate the FAA's policy on associated elements

C&L	Current C&L	Requested Revision
10	Amazon must maintain a configuration control document listing each major component installed in the UAS, and their associated systems (i.e., motors, propellers, servos, batteries, navigation equipment, communication equipment, software, ground control station hardware, etc.). The list must contain the part-numbers and modification levels of equipment as applicable. The list must be revised to represent the latest UAS configuration. Amazon must retain configuration control document records at least until this grant expires. The configuration control document must be provided to the FAA upon request. All MK27 UAS operated by Amazon must conform to the following configuration control document (Amazon Prime Air MK27, Configuration Document) at the revision level listed, or later revision as approved by the Administrator prior to implementation.	Amazon must maintain a configuration control document listing each major component installed in the drone (a component list), and the drone system's associated elements (AE list). The component list must contain the part-numbers and modification levels of equipment as applicable. The AE list must identify the specific elements or minimum specifications for the elements necessary for operation of the drone system. The list must be revised to represent the latest drone system configuration. Amazon must retain configuration control document records until this grant expires and provide them to the FAA upon request. All drone systems operated by Amazon must conform to the configuration control document at the revision level listed, or later revision as approved by the Administrator prior to implementation.

Prime Air seeks to align C&L 10 with the FAA's July 13, 2021 policy memorandum pertaining to drone type certification by removing certain items excluded from the type design from the configuration control document.[15] The FAA clarified that it would consider the drone as part of the drone system certification basis encompassed by the type design, and that associated elements (AE), which include elements that are not airborne or directly affixed to the aircraft, will be outside the scope of the type design. Prime Air will maintain the AE in accordance with the Prime Air AE configuration control and change management policies and procedures. Prime Air also requests that the phrase, "at least," be deleted from the requirement to maintain configuration control document records because it creates a requirement of indefinite length. Prime Air proposes that it is sufficient to maintain the records until Exemption No. 18602 expires.

[15] Memorandum No. AIR600-21-AIR-600-PM01, *FAA Approval of Unmanned Aircraft Systems (UAS) Special Class UA Projects and their Associated Elements* (July 13, 2021).

3. Remove requirement for AOs and SOs

C&L	Current C&L	Requested Revision
19	Amazon must provide sufficient Aircraft Observers (AOs) and Safety Officers (SOs) so that they can adequately perform visual or audible identification of abnormal aircraft behavior during flight from the ground.	*Delete C&L*

For the reasons discussed in Section II, the AO and SO roles are no longer necessary to safely operate the MK27-2 drone system.

4. Remove requirement to designate emergency landing areas

C&L	Current C&L	Requested Revision
21	Prior to each operation, Amazon must designate safe emergency landing area(s) which the UA can reach if it is unable to complete the intended flight; and, identify such emergency landing area(s) to the PIC and GSO operating aircraft in that area. The emergency landing area(s) must: a. Be no less than 100 feet in diameter; b. Be known in advance to the PIC and GSO operating aircraft in that area; c. Be at least 250 feet from structures, vehicles, human beings, and roads; and d. Provide for a landing without undue hazard to human beings or property on the ground.	*Delete C&L*

The MK27-2's ability, during an off-nominal situation, to navigate to an area free of structures and obstacles (e.g., a grassy field) and find a safe landing area in real time removes the need to designate an emergency landing area. To further support this capability, delivery missions follow pre-planned routes that fly over sufficient areas free of permanent obstacles, and those routes are validated to be within the MK27-2's capabilities through simulation before they're flown.

5. Remove minimum standoff distances

C&L	Current C&L	Requested Revision
22	Amazon must adhere to all of the following requirements when conducting operations under this exemption: a. Operations over or within 250 feet laterally of moving vehicles are prohibited.	Amazon must adhere to all of the following requirements when conducting operations under this exemption: a. Sustained flight directly over roadways is prohibited and is limited to only crossing

C&L	Current C&L	Requested Revision
	b. Sustained flight within 250 feet laterally of roadways is prohibited. c. Operations over human beings and structures are prohibited. Additionally, the UA must remain at least 100 feet laterally from any person or structure during all phases of flight. d. Transitions over roadways are prohibited except as provided in the FAA-approved Amazon Prime Air MK27, Concept of Operations. e. Operations are permitted only in sparsely populated areas.	over roadways in minimal time when necessary to complete a flight. b. Sustained flight over non-participating human beings is prohibited. c. Operations over non-participants and structures are limited to transient flight only. d. Transient or sustained operation over any open-air assembly of people is prohibited. e. Operations are not permitted in urban areas.

Prime Air's previously described route planning and validation, along with the MK27-2's enhancements, allow the drone to safely conduct transient flights over people, roads, and structures. Additionally, the drone can safely conduct delivery flights in rural areas.

6. Revise the stand-off distance for functional test flights

C&L	Current	Requested Revision
25	An MK27 UAS that has undergone maintenance or alterations that affect the MK27 UAS operation or flight characteristics (e.g. replacement of a flight critical component) must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights must be conducted by a PIC within visual line-of-sight, or BVLOS with a visual observer. Functional test flights must be conducted with any other personnel required to conduct the functional test flight (such as a mechanic or technician) and must remain at least 500 feet from all other non-participating people. The functional test flight must be conducted in accordance with the Amazon Prime Air MK27, Unmanned Aircraft Maintenance Manual and in a manner that does not pose an undue hazard to human beings and property.	A drone that has undergone maintenance or alterations that affect the drone operation or flight characteristics (e.g. replacement of a flight critical component) must undergo a functional test flight prior to conducting further operations under this exemption. Functional test flights must be conducted with personnel required to conduct the functional test flight (such as a mechanic or technician) and must remain clear of all other non-participating people. The functional test flight must be conducted in accordance with the latest approved version of Amazon's maintenance manual and in a manner that does not pose an undue hazard to human beings and property.

C&L 25 currently requires, among other things, that the original MK27 remain at least 500 feet from all non-participating people during a functional check flight. The 500-feet standoff requirement for the MK27-2 is larger than necessary to ensure the safety of non-participating people given the MK27-2's enhancements. Prime Air requests that the distance be replaced with a requirement to remain clear of non-participating people and that any required standoff distance for functional test flights be defined in the relevant Supporting Documents.

Prime Air also requests that the requirement to conduct functional test flights within visual line of sight of the operator or BVLOS with a visual observer be deleted because it is redundant. All of Prime Air's drone operations must be conducted under that condition, and deleting it from C&L 25 will remove the likelihood of confusion about the requirements for functional test flights.

7. Remove FTS equipment

C&L	Current C&L	Requested Revision
27	The ground station remotes must be available, functional, and staffed prior to the commencement of any flight.	*Delete C&L*

The ground station remote is a piece of equipment required to operate the original MK27's FTS. Because the MK27-2 will not have an FTS, this C&L is unnecessary.

B. Exemption 18601

Prime Air requests that Exemption 18601's C&Ls be revised, as set forth in Appendix B, to add the MK27-2 and reflect the new crew complement. Prime Air also requests the following amendments to Exemption 18601 to account for the MK27-2's enhancements and remove redundant regulatory requirements.

1. Remove redundant hazardous materials program requirements

C&L	Current C&L	Requested Revision
7	This exemption is only valid for a "will-not carry" hazardous materials program. A change to a "will-carry" hazardous materials program requires a new evaluation by the FAA and amendment to this exemption.	*Delete C&L*

As an FAA-certificated air carrier Prime Air must comply with the terms of its certificate, which are set out in its FAA-issued operations specifications.[16] Prime Air's operations specifications currently contain an authorization prohibiting the acceptance, handling,

[16] 49 U.S.C. § 44711(a)(4); 14 C.F.R. § 119.49.

and transportation of hazardous materials.[17] To transport hazardous materials in the future, Prime Air would have to obtain FAA approval of its hazard materials manual and training program and updated operations specifications. C&L 7 should be removed because it is redundant to Prime Air's existing regulatory obligations.

2. Remove prescriptive minimum cruise altitude

C&L	Current C&L	Requested Revision
11	Flight operations must be conducted referenced to ground level, with a minimum safe altitude during cruise of 180 ft. AGL. The altitude of the aircraft must not exceed 400 ft. AGL.	Flight operations must be conducted at an altitude that would not create a hazard to persons or property on the ground. Flight operations must not exceed 400 ft. AGL.

Prime Air requests that FAA remove the reference to a specific minimum safe altitude during cruise. The MK27-2 can ascend and descend during cruise to track terrain variations, and flights will be pre-planned to ensure the drone avoids ground-based obstacles. Prime Air will review FAA's Daily Digital Obstacle File and NOTAMs to ensure its route planning captures any new potential ground hazards. Prime Air's route planning and the MK27-2's enhanced features render a prescriptive generic minimum altitude unnecessary for safe operations.

3. Remove operational limitations to remove redundancy with Exemption 18602 C&L 22 and account for MK27-2 enhancements

C&L	Current C&L	Requested Revision
16	The certificate holder must adhere to the following requirements: a. All operations must fly over airport property and contiguous parcels for which Amazon has pre-arranged exclusive use or access control. b. Operations over or within 250 ft. laterally of moving vehicles are prohibited. c. Sustained flight within 250 ft. laterally of roadways is prohibited. d. Operations over human beings and structures are prohibited. Additionally, the UA must remain at least 100 ft. laterally from any person or structure during all phases of flight. e. Transitions over roadways are prohibited except as provided in the FAA-approved Amazon Prime Air MK27, Concept of Operations. f. Operations are permitted only in sparsely populated areas.	*Delete C&L*

[17] 14 C.F.R. § 119.49(c)(12); Amazon Prime Air Operations Specifications Para. A004.

Prime Air requests that C&L 16 be deleted for two reasons. First, the MK27-2 is designed to safely transit over people, roads, and structures to deliver packages in customer backyards. C&L 16(a) is no longer necessary because the MK27-2's enhancements allow it to operate safely over all rural areas, regardless of whether Prime Air has pre-arranged exclusive use or access control. Second, C&L 16(b) – (f) should be removed because they repeat the former operational limitations found in C&L 22 of Exemption No. 18602. Prime Air has requested that these limitations be amended, and the new limitations should exist only in Exemption No. 18602 to prevent potential misalignment.

4. Remove predetermined emergency landing areas

C&L	Current C&L	Requested Revision
17	The certificate holder must designate safe emergency landing area(s) that are no less than 100 ft. in diameter, which the UA can reach in case it is unable to complete the intended flight. These landing areas must: a. Be known in advance to the PIC and GSO operating aircraft in that area; and b. Be 250 ft. from structures, vehicles, people, and roads. Provide for a landing without undue hazard to persons or property on the surface.	*Delete C&L*

For the reasons discussed in Section III.A.4 of this petition, Prime Air requests that C&L 17 be deleted.

5. Reduce obstruction clearance requirements

C&L	Current C&L	Requested Revision
41	All sparsely populated terrain and all human-made obstructions must be cleared by not less than 100 ft. laterally until the UA has slowed to less than 20 knots and is within 250 ft. laterally of a takeoff, landing, or delivery point.	*Delete C&L*

As discussed above, the MK27-2's enhancements allow it to safely conduct transient flight over people and structures, and this C&L should be removed to reflect that capability. The MK27-2 will conduct delivery operations closer than 100 feet laterally to structures in order to reach customer backyards, and its onboard health monitoring and perception systems will ensure there is no risk to the safety of humans or structures.

6. Remove requirement for private pilot certificate

C&L	Current C&L	Requested Revision
48	Each PIC, GSO, check pilot, and flight instructor must hold a private pilot certificate issued under part 61, and a remote pilot certificate issued in accordance with 14 CFR part 107 that remains current in accordance with § 107.65. The pilot must have the pilot certificates and a valid government issued photo ID in his or her possession and make them available to the Administrator, or any law enforcement official, upon request.	Each OIC, check operator, and flight instructor must hold a remote pilot certificate issued in accordance with 14 CFR part 107 that remains current in accordance with § 107.65. The OIC must have the remote pilot certificate and a valid government issued photo ID in their possession and make them available to the Administrator, or any law enforcement official, upon request.

C&L 48 should be revised to remove the requirement that a person acting as an OIC, check operator, and flight instructor hold a pilot certificate issued under 14 C.F.R. Part 61. Operations of the highly autonomous MK27-2 can be safely conducted by persons holding a current remote pilot certificate issued in accordance with 14 C.F.R. Part 107 that have received platform-specific training based on Part 61 licensing requirements.[18] The MK27 is an autonomous system that flies a pre-planned route and has limited opportunities for command inputs—takeoff and urgent land. The pilotage skills that a Part 61 licensed pilot uses to operate an aircraft are not performed in the operation of the drone. Amazon will provide robust platform-specific training to all OICs in accordance with the approved MX27 CX-2 training curriculum. All OICs will have their Part 107 certificate and government issued photo ID in their possession during operations and make them available to the Administrator, or any law enforcement official, upon request.

7. Remove requirement for second class medical certificate

C&L	Current C&L	Requested Revision
51	Each check pilot and flight instructor must hold at least a second class medical certificate when serving as a required crewmember. A copy of this certificate must be kept in the pilot's records.	Each check operator and flight instructor must hold at least a third class medical certificate when serving as a required crewmember. A copy of this certificate must be kept in the operator's records.
54	Each PIC, GSO, and SO is required to hold a second class medical certificate in accordance with § 61.23(a)(2). Amazon must retain a copy of this certificate in the	Each OIC is required to hold a third class medical certificate in accordance with § 61.23(a)(2). Amazon must retain a copy of this certificate in the operators'

[18] *See, e.g., In the Matter of the Petition of Wing Aviation, LLC*, Amended Grant of Exemption No. 18163A, at 11 (Oct. 11, 2019).

	pilots' records. Additionally, PICs and GSOs are prohibited from conducting flight operations during medical deficiency in accordance with § 61.53(a).	records. Additionally, OICs are prohibited from conducting flight operations during medical deficiency in accordance with § 61.53(a).

The medical certificate requirements for OICs, check operators, and flight instructors should be revised to require a third class medical certificate because it is sufficient, given the scope of their roles, to ensure they can complete their duties without impacting the safety of the operation. The requirements of a second class and third class medical certificate differ only in the eye standards,[19] and individuals who do not meet either of these requirements may still be issued a second or third class medical certificate.[20] All other eligibility requirements (ear, nose, throat, and equilibrium; mental; neurological; cardiovascular; and general medical condition) are identical.[21] OICs of the MK27-2 do not engage in direct manipulation of the drone's flight path, and the drone is designed to operate autonomously and be capable of safely completing its mission without any human intervention. The medical tests conducted during the examination for a second class medical certificate would not provide any additional assurances that the individual does not have a medical condition that could affect the safety of operations above those offered by a third class medical certificate. Therefore, no incremental safety benefit is realized by requiring these positions to hold a second class medical certificate instead of a third class medical certificate.

Indeed, the FAA does not require a medical certificate of any kind for pilots of light-sport aircraft[22] or a current medical certificate for pilots of aircraft up to 6,000 lbs who operate in accordance with BasicMed.[23] Requiring a second class medical certificate, instead of a third class, for the autonomously operated CX-2 is unwarranted due to the low risk presented and is inconsistent with the FAA's position that pilots of larger aircraft carrying passengers may operate without a current medical certificate.

IV. Granting Amazon's Petition is in the Public Interest and Will Not Adversely Affect Safety

The favorable public interest factors discussed in Amazon's July 16, 2019 petition and affirmed by the FAA's grant of the Exemptions apply equally here, and the MK27-2's

[19] The second class medical certificate standards require distant visual acuity of 20/20 or better in each eye separately, with or without corrective lenses. 14 C.F.R. § 67.203(a). The third class medical certificate standards require distant visual acuity of 20/40 or better in each eye separately, with or without corrective lenses. 14 C.F.R. § 67.303(a).

[20] 14 C.F.R. §§ 67.215, 67.315.

[21] *Compare* 14 C.F.R. part 67, subpart C (second class medical) *with* 14 C.F.R. part 67, subpart D (third class medical).

[22] 14 C.F.R. § 61.303.

[23] 14 C.F.R. § 61.113(i).

enhancements allow the Exemptions' C&Ls to be amended without adversely impacting safety.

A. Amazon Prime Air's Request is in the Public Interest

Allowing Prime Air to expand its drone delivery operations with the next iteration of its MK27 drone is in the public interest because it promotes the safe progression of drone integration into the NAS.[24] The FAA Reauthorization Act of 2018[25] requires the FAA to update its regulations to authorize the carriage of property by drones, and as the FAA has recognized, such rulemaking requires data to justify and support the FAA's policy decisions.[26] Extending the Exemptions provides the FAA with practical experience and data concerning drone air carrier operations that it can use to learn about appropriate risk mitigation measures so it can implement section 348 of the FAA Reauthorization Act of 2018.

Additionally, allowing Prime Air to move to the next phase of its building-block approach to scale drone delivery will lead to fewer road accidents and reduced carbon dioxide emissions.[27] A 2020 Virginia Tech report on the potential economic impact of drone delivery found that drone delivery at scale would bring meaningful social, economic, and mobility benefits by reducing unnecessary travel and saving time; reducing vehicle traffic, carbon dioxide emissions, and road accidents; and improving access to essential supplies that improve long-term health outcomes.[28]

B. The Requested Amendments Will Not Adversely Affect Safety

To support the incremental development of Prime Air's drone delivery operations, Prime Air has incorporated into the MK27-2 the lessons learned from both practical experience operating the original MK27 and from its robust requirements-based testing program. Prime Air's testing program derives test cases, conditions, and data from system, sub-system, and component requirements, validating each using test labs, analysis, or flight test. This includes verification of aircraft functional requirements as well as performance, reliability, and usability.

This petition represents the next step in Amazon Prime Air's measured, building block approach to ensuring that our operations will achieve the levels of safety needed to meet our commitment to our customers and the public. The MK27-2 continues to

[24] *See* Exemption No. 18602, at 6.

[25] FAA Reauthorization Act of 2018, Pub. L. 115-254, § 348 (Oct. 5, 2018).

[26] *See* Exemption No. 18602, at 6.

[27] *See* Virginia Tech, *Measuring the Effects of Drone Delivery in the United States*, Sep. 2020, available at https://vtechworks.lib.vt.edu/handle/10919/100104.

[28] *Id.*

maintain the robust, multilayered technical and operational safety mitigations built into the original MK27, while improving on them in significant respects. As described in this Petition and in the Supplemental Documents, the MK27-2 will operate safely under the requested amendments to the Exemptions.

In its grant of Exemption No. 18601, the FAA indicated that, as it "gains more data and experience with operations of this kind and learns from each operator, the FAA might adjust its policy. Some adjustments might warrant a revision to this exemption or the issuance of a new exemption."[29] Since the Exemptions were granted, Prime Air and the FAA have gained substantial data and experience with drone delivery operations. It is now appropriate to amend the Exemptions' C&Ls to support the MK27-2's enhanced autonomous operations.

V. A Summary FAA Can Publish in the Federal Register

Petitioner seeks amendments to previously issued exemptions: (1) from 14 C.F.R. § 135.25(a)(1)-(2) pursuant to 49 U.S.C. § 44807 to operate a civil aircraft in air commerce without an airworthiness certificate; and (2) from 14 C.F.R. §§ 61.23, 61.133, 91.113(b)-(f), 91.119(b)-(c), 91.121, 91.151(a), 135.63(c)-(d), 135.65(d), 135.93(g), 135.149(a), 135.161(a)(1)-(3), 135.203(a), 135.209(a), 135.243(b)(1)-(3), 135.415(b) and 135.501(a) to permit operations under a Part 135 air carrier operating certificate with a drone system, to enable petitioner's commercial delivery operations using drones. The purpose of the amendments is to reflect enhancements to its drone and operating procedures.

* * *

Amazon Prime Air urges the FAA to expeditiously grant this petition so that we can move forward with taking the next steps in the evolution of commercial drone delivery in the United States. Please do not hesitate to contact me via email at amazon-prime-air-exemption@amazon.com if you have any questions or concerns.

Respectfully submitted,

Sean Cassidy

Sean Cassidy
Director, Safety, Flight Operations & Regulatory
Amazon Prime Air

[29] Grant of Exemption No. 18601 (Aug. 27, 2020) at 12, Docket FAA-2019-0573.

Appendix A

Administrative Revisions to Exemption 18602 C&Ls to Add MK27-2[30]

C&L	Current C&L	Requested Revision
1	Operations authorized by this grant of exemption are limited to the Amazon Prime Air MK27 UAS. Operations under this exemption may only be conducted in conjunction with the conditions and limitations issued in the companion operating exemption, Exemption No. 18601 or validation flights conducted in conjunction with the FAA review of an application for a part 135 operating certificate.	Operations authorized by this grant of exemption are limited to the Amazon Prime Air MK27-2 drone system. Operations under this exemption may only be conducted in conjunction with the conditions and limitations issued in the companion operating exemption, Exemption No. 18601 or validation flights conducted in conjunction with the FAA review of an application for a part 135 operating certificate.
3	Amazon must maintain and adhere to the following manuals at the revision level listed in this Condition and Limitation, or a later revision, if approved by the Administrator: a. Amazon Prime Air MK27, Unmanned Aircraft Flight Manual (UFM), Revision 0, 08/14/2020 b. Amazon Prime Air MK27, Unmanned Aircraft Maintenance Manual (UMM), Revision 0, 08/14/2020 c. Amazon Prime Air MK27, Operator Handbook, Revision 0, 08/14/2020 d. Amazon Prime Air MK27, Concept of Operations, Revision 0, 08/14/2020	Amazon must maintain and adhere to the following manuals at the latest revision level approved by the FAA. MK27-2: a. Prime Air General Operations Manual (GOM); b. Prime Air General Maintenance Manual (GMM); c. Prime Air Flight Operations Training Manual (FOTM); d. Maintenance Operations Training Manual (MOTM); e. Prime Air MK27-2 Aircraft Flight Manual (AFM); and f. Prime Air MK27-2 Aircraft Maintenance Manual (AMM).
7	The MK27 UA must not be operated higher than 400 feet above ground level (AGL).	Amazon must not operate the drone higher than 400 feet above ground level (AGL).
9	Any change to the MK27 UAS hardware and software must be approved by the FAA prior to its implementation.	Any change to the drone hardware and software must be approved by the FAA prior to its implementation.

[30] Where appropriate, Amazon Prime Air removed reference to a specific version of the MK27 drone.

C&L	Current C&L	Requested Revision
11	Amazon may not operate the MK27 UA with known inoperable instruments or equipment except in accordance with a minimum equipment list (MEL) that has been prepared in accordance with 14 CFR § 135.179 and approved by the FAA. As an MEL has not been developed for this MK27 UA, if Amazon desires to utilize a MEL, it must develop its own proposed MEL and submit it to the FAA for approval.	Amazon may not operate the drone with known inoperable instruments or equipment except in accordance with a minimum equipment list (MEL) that has been prepared in accordance with 14 CFR § 135.179 and approved by the FAA.
12	Prior to the commencement of any flight, the PIC must ensure that the pilot interface, as described in the UFM, and all UAS systems designed to warn the PIC that the MK27 UA has violated the volume of airspace surrounding the UA's flight path, are functioning properly.	Prior to the commencement of any flight, the OIC must ensure that the operator interface, as described in the UFM, and all drone systems designed to warn the OIC that the MK27-2 drone has violated the volume of airspace surrounding the drone's flight path, are functioning properly.
16	The MK27 UAS pilot interface must display all of the following information from the MK27 UA in real time: altitude, position, direction of flight information, and flight mode. All of the information identified in this condition and limitation must be available at all times to the PIC, when conducting flight operations.	The drone system operator interface must display all of the following information from the drone in real time: altitude, position, direction of flight information, and flight mode. All of the information identified in this condition and limitation must be available at all times to the OIC, when conducting flight operations.
17	The MK27 UAS pilot interface must provide an audible and visual alert of degraded system performance, UAS malfunction, and loss of Command and Control link with the MK27 UA. When conducting operations, this information must be available at all times to the PIC.	The drone system operator interface must provide an audible and visual alert of degraded system performance, drone system malfunction, and loss of Command and Control link with the drone. When conducting operations, this information must be available at all times to the OIC.
18	The MK27 UAS must detect engine failures and the pilot interface must provide an alert of any engine failure.	The drone system must detect engine failures and the operator interface must provide an alert of any engine failure.

C&L	Current C&L	Requested Revision
24	The MK27 UAS may not be operated by any person from any moving vehicle or aircraft.	The drone system may not be operated by any person from any moving vehicle or aircraft.
26	Amazon must comply with 14 CFR part 43 with respect to any maintenance, rebuilding, and alteration of the MK27 UAS, as if the aircraft has a standard airworthiness certificate. For purposes of this exemption, including compliance with this condition and limitation: a. Amazon is considered the aircraft manufacturer. b. Airworthiness means the aircraft is in a condition that meets the FAA-approved configuration described in the Amazon Prime Air MK27, Configuration Document; and, is in a condition for safe operation.	Amazon must comply with 14 CFR part 43 with respect to any maintenance, rebuilding, and alteration of the drone, as if the aircraft has a standard airworthiness certificate. For purposes of this exemption, including compliance with this condition and limitation: a. Amazon is considered the aircraft manufacturer. b. Airworthiness means the aircraft is in a condition that meets the FAA-approved configuration; and, is in a condition for safe operation.

Appendix B

Amendments to Exemption 18601 to Add MK27-2 and Incorporate New Crew Positions

1. Revisions to Exemption No. 18601 to add MK27-2

C&L	Current C&L	Requested Revision
1	Operations authorized by this grant of exemption are limited to those that occur with the Amazon Prime Air MK27 UAS, subject to Exemption No. 18602.	Operations authorized by this grant of exemption are limited to those that occur with Amazon Prime Air drone systems listed in the latest amendment to Exemption No. 18602.
3	All operations conducted in accordance with this exemption must also be conducted in accordance with Exemption No. 18602, until the MK27 aircraft receives an FAA airworthiness certificate.	All operations conducted in accordance with this exemption must also be conducted in accordance with Exemption No. 18602, until the aircraft receives an FAA airworthiness certificate.

2. Revisions to Exemption No. 18601 to incorporate MK27-2 crew positions

C&Ls to Modify	Requested Changes
19	Remove references to GSOs and reassign all functions previously assigned to the GSO to the OIC
20	Remove references to GSOs, SOs, and AOs
24	Remove references to GSOs and SOs
32	Remove reference to GSOs
33	Remove reference to GSOs
36	Remove reference to AOs and SOs
37a	Rename FAs to AVAs
37d	Remove because no AOs will be used
37e	Remove because no AOs will be used
37f	Remove reference to GSO and revise to reflect updated functions of SOs in alignment with the GOM
37g	Remove and revise to reflect updated functions of SOs in alignment with the GOM
37h	Remove because no GSOs will be used
37i	Remove references to GSOs and AOs, and rename FAs to AVAs
38	Remove reference to AOs and SOs

C&Ls to Modify	Requested Changes
39	Remove references to the GSOs and AOs. Remove SO and revise description of the SO's duties to reflect changes to functions resulting from removal of the FTS
40	Remove references to GSOs, SOs, and AOs
45	Remove because no AOs will be used
46	Remove references to GSOs, SOs, and AOs
48	Remove references to GSOs
52	Remove references to GSOs
53	Remove references to AOs and SOs, rename FAs to AVAs
54	Remove references to GSO and SO
55	Remove references to GSOs, SOs, and AOs, and rename FAs to AVAs
56	Remove references to GSOs
57	Remove references to GSOs, AOs, and SOs; rename FAs to AVAs
58	Remove references to GSOs, AOs, and SOs; rename FAs to AVAs
59	Remove references to GSOs, AOs, and SOs; rename FAs to AVAs
61	Remove references to GSOs
65	Remove references to AOs
66	Remove references to AOs and SOs
66g	Remove references to AOs and SOs
67	Rename FAs to AVAs
68	Remove reference to GSOs
69	Rename FAs to AVAs
75	Remove references to GSOs, SOs, AOs, and rename FAs to AVAs
76	Remove references to GSOs, SOs, and AOs; and rename FAs to AVAs
77	Remove references to GSOs, SOs, and AOs; rename FAs to AVAs