Exemption No. 12555

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION WASHINGTON, DC 20591

In the matter of the petition of

AIRLINES FOR AMERICA

Regulatory Docket No. FAA-2015-0971

for an exemption from § 91.227 of Title 14, Code of Federal Regulations

GRANT OF EXEMPTION

By letter dated April 1, 2015, Mr. Paul J. McGraw, Vice President, Operations and Safety, Airlines for America (A4A), 1301 Pennsylvania Ave, NW, Suite 1100, Washington, DC 20004-1707 petitioned the Federal Aviation Administration (FAA), on behalf of A4A member airlines, for an exemption from the Navigational Accuracy Category for position (NACp) and Navigational Integrity Category (NIC) requirements in § 91.227(c) of Title 14, Code of Federal Regulations (14 CFR) for Automatic Dependent Surveillance-Broadcast (ADS-B) Out. The proposed exemption, if granted, would permit operations during periods when installed ADS-B Out equipment does not achieve the required accuracy or integrity performance, and where an alternate means of traffic surveillance safely used today can be implemented by FAA. A4A requests this relief for a period of five years, beginning January 1, 2020 and expiring on December 31, 2024.

The petitioner requests relief from the following regulations:

When operating aircraft equipped with ADS-B Out in accordance with 14 CFR 91.225, the aircraft equipment must meet the performance requirements of 91.227. Relief is sought from:

Section 91.227(c)(1)(i), which requires the aircraft's NACp to be less than 0.05 nautical miles (NM).

Section 91.227(c)(1)(iii), which requires that the aircraft's NIC must be less than 0.2 NM.

AJV-15-1114-E

The petitioner supports its request with the following information:

A4A states that to meet compliance for ADS-B Out in January 2020 under the rule requires a two-step process. First, the Original Equipment Manufacturers (OEMs) and avionic manufacturers must produce equipment necessary to meet the requirements of 14 CFR 91.227 and issue service bulletins, or alternatively, operators must obtain a Supplemental Type Certificate (STC) for their aircraft. Second, the operators must retrofit aircraft with the equipment and information produced from the first step, which is time consuming for large fleets due to maintenance scheduling. A4A states that at this time, avionics manufacturers have not made available certified equipment that meets the requirements under the rule. A4A further states that while industry groups are working towards solutions that would provide enhanced GPS integrity and accuracy for ADS-B Out position sources, those enhancements will not be available for air transport category aircraft before the equipment requirement date in 2020.¹

A4A contends that the position accuracy and integrity performance requirements of 14 CFR 91.227(c) exceed the capabilities of GPS receivers currently available for use in transport category airplanes. A4A also contends, however, that the performance capabilities of existing GPS receivers provide a safe means of surveillance when alternate surveillance sources, such as secondary surveillance radar (SSR), are available. In addition, A4A states that many SSRs are expected to remain available for the foreseeable future, and certainly beyond January 1, 2025, but notes that there will be fewer SSRs in the National Airspace System (NAS) over time, due to planned reductions.

A4A states the following reasons for seeking relief at this time:

Carriers need assurance that aircraft retrofit/equipage completed prior to the ADS-B Out deadline will ensure uninterrupted operation after the January 1, 2020, deadline, even during periods of GPS degradation.

The scope of this exemption is limited, because GPS disruption or inability to meet the ADS-B Out performance requirements for aircraft equipped with SA-Aware and SA-On equipment² will be rare and infrequent. Use of SSR as backup will eliminate any adverse operational effects of SA-Aware and SA-On receivers not meeting ADS-B Out performance for NIC and NACp.

Alternate means of surveillance during such occurrences exist today and are used safely

GPS receivers capable of meeting the 14 CFR 91.227(c) accuracy and integrity requirements under a wide variety of GPS satellite constellation conditions are not

¹ ARINC report 660B, "CNS/ATM Avionic Architecture Supporting NEXTGEN/SESAR Concepts."

² Further in this document, the FAA discusses SA-Aware and SA-On equipment in detail.

available for purchase or installation in many transport category airplanes and may not be available in quantity until after January 1, 2020.

A4A argues that a grant of exemption would not adversely affect safety because the FAA would continue to use air traffic separation methods that are used today to safely manage operations. In addition, this petition if granted would be in the public interest by facilitating the operators' planned upgrade path for fleet compliance. The ability for operators to commit to upgrade plans instead should motivate vendors to improve the product availability so that a more coordinated effort can occur during the exemption period. A4A also argues that absent this proposed relief, operators will be forced to adopt a two-step process to upgrade the aircraft position source with a short-term fix and second step to provide full compliance or face the possibility of service interruptions if the GPS satellite constellation is reduced from its current levels. This would result in added delays to the NAS, and adversely impact the public. The FAA has invested significant public funds readying the NAS for this step forward in the NextGen effort. Granting this exemption would assure that this public investment is usable by operators and allows FAA to proceed with a retirement schedule for identified aging terminal area SSR systems.

A4A proposed that interested operators individually request the use of the exemption described in the petition. Operators would submit a GPS equipage plan to the FAA during the transition period, committing to equipage compliance to meet the requirements of 14 CFR 91.227 by January 2025. Operator specific plans should be available to the FAA by August 2018 with annual updates that reflect increased technical and schedule confidence and details. Additionally, the plan should be mature and include a high confidence of execution and may include:

- 1) Manufacturer and Part Number, applicable service bulletin, or STC, of GPS receiver to be implemented;
- 2) Upgrade schedule, preferably tail-number specific;
- 3) Interim fleet milestone, e.g. initial installation, 30 percent, 80 percent, 100 percent completion; and
- 4) If a specific set of aircraft will not be upgraded but are desired to be covered by the Exemption, the operator's plan for fully rule-compliant operation beyond the expiration of the Exemption must be included (e.g. the use of Service Availability Prediction Tool (SAPT), even for SA-Aware equipage and possible operational impacts).

A summary of the petition was published in the <u>Federal Register</u> on May 7, 2015 (80FR26317). Seven comments were received.

American Airlines (American), United Airlines (United), Boeing, United Postal Service (UPS), FedEx, Delta Airlines, and one individual pilot/homebuilt operator were in support of the FAA granting an exemption to A4A's petition, and expressed support of the development and deployment of ADS-B Out.

United supported the petition for exemption in that it would avoid multiple navigation upgrades and allow for the development of multi-constellation Global Navigation Satellite System (GNSS) receivers. United also commented that there is a slow rate of standards development of new GNSS constellations and requested that the FAA assist in accelerating the development of standards for GALILEO and the GPS L5 signal, because, without standards, multi-mode receivers (MMRs) will not be able to receive multiple constellations. United argues that this will impede carriers from upgrading their MMRs prior to the proposed 2025 deadline, and thereby need an extension to this exemption, if granted. Lastly, United urged the FAA to establish policy on the acceptability of using non-GPS GNSS constellations for navigation.

American supported the need for the exemption as it would allow development of integrated systems that will support the communication, navigation and surveillance requirements of the future and it will support final harmonization of ADS-B requirements with other operational regions. American separately stated its concern regarding the FAA's use of the SAPT³, which is software designed to report "predicted availability" for technical standard order (TSO) compliant GPS position sources. American believes the use of the prediction tool will be operationally problematic for many operators.

Boeing and FedEx supported the petition and agreed that the requested 5 year period for relief would allow U.S. carriers adequate and necessary time to incorporate suitable position sources that meet the performance rules. UPS notes that it has extensive experience with ADS-B Out equipment, including SA-on and SA-aware GPS receivers, some of which meet the requirements of 14 CFR 91.227. UPS commented that the exemption would allow a much more efficient upgrade path to transition to the next generation of GPS receivers, either Satellite Based Augmentation System (SBAS) or multi constellation capable units, while still maintaining active ADS-B Out reporting requirements.

One individual stated that the FAA should consider relaxing the requirement for TSOcompliant Wide Area Augmentation System (WAAS) GPS units in light private

³ The ADS-B Service Availability Prediction Tool (SAPT) is a preflight availability verification tool that predicts the ability of an aircraft to meet the requirements of 14 CFR 91.227(c)(1)(i) and (iii)along a given route of flight. This prediction is based on the ability of the aircraft avionics to meet performance requirements specified in Technical Standard Orders (TSOs) C129, C129a, C145c/C146c, and C196, as well as the predicted status of the Global Positioning System (GPS) constellation. The SAPT will also evaluate if backup surveillance is available where ADS-B outages are predicted, which can be used by the FAA to determine if a particular non-compliant flight can be accommodated.

aircraft, not just air carriers. The commenter also expressed concerns regarding the costs of equipping light private aircraft that are based within 30NM of a major airport with Class B or C airspace with GPS receivers

FAA response to comments

The FAA and the Equip 2020 working group⁴ continue to work with the aviation industry toward reaching a collaborative solution to predict times and locations of reduced GPS performance for different aviation receivers.

The FAA agrees with the commenters with respect to the need to continue work with industry to develop equipment standards and operational policies as soon as the technologies are mature for the standards for multi-frequency/multi-constellation equipment. However, the FAA does not agree that the transition to ADS-B could be further extended beyond the petition date of December 31, 2024. The basis for this petition is rooted in the lack of a currently available solution from some aircraft manufacturers, and these manufacturers have indicated that one will become available within the next few years.

As stated in the ADS-B Out Final Rule, operators may equip with any position source and WAAS is not required, thus there is no requirement for WAAS receivers.⁵ On February 9, 2015, the FAA published an amendment to the ADS-B Out final rule that corrected an inadvertent error and clarified that the ADS-B Out equipment installed must meet the performance requirements of the Technical Standard Orders identified in the regulations.⁶

The FAA's analysis is as follows:

The ADS-B Out rule specifies the aircraft's ADS-B equipment performance requirements for each flight in airspace designated by the rule. For each aircraft, the achieved performance depends on the type of GPS receiver that is used as the ADS-B position source. The quality of each type of receiver can be described by its "rule performance" ⁷availability, which is the average percentage of time and locations that it is capable of meeting the requirements of 14

⁴ On October 28, 2014, the FAA hosted a meeting with industry representatives of pilots, operators, installers, suppliers and senior FAA officials to identify and address barriers to equipping with ADS-B Out by January 1, 2020, as required by 14 CFR §§ 91.225 and 91.227. The resulting action plan was provided to the NextGen Institute, which convened the Equip 2020 working group to continue a collaborative discussion to address the identified barriers.

⁵ Automatic Dependent Surveillance-Broadcast (ADS-B) Out Performance Requirements To Support Air Traffic Control (ATC) Service Final Rule; 75 Fed. Reg. 30160, 30172; May 28, 2010.

⁶ Automatic Dependent Surveillance-Broadcast (ADS-B) Out Performance Requirements To Support Air Traffic Control (ATC) Service, Technical Amendment; 80 Fed. Reg. 6899; February 9, 2015.

⁷ As used in this grant of exemption, "rule performance" means achieving the performance requirement of 14 CFR 91.227(c)(1)(i) and (iii) for NACp and NIC.

CFR 91.227 and therefore capable of operating in the airspace designated by the rule. The ADS-B Out rule does not dictate any particular type of GPS receiver or any availability.

Three different variants of GPS receivers are currently in use by operators that satisfy the ADS-B Out performance requirements, to varying degrees, when adequate numbers of GPS satellites can be detected by the aircraft. Two variants of GPS receivers differ in their ability to interpret and report potential accuracy and integrity of navigation performance, based on design assumptions regarding whether Selective Availability (SA) is activated. SA was a feature that deliberately degraded the GPS satellite signal, resulting in a reduction of the reported accuracy of an aircraft's position. On May 1, 2000, the United States deactivated SA to allow more accurate civilian use of GPS.⁸ SA is not included in new GPS satellite designs. A third variant of GPS receivers uses signals from a satellite-based augmentation system (SBAS) to improve accuracy and integrity of navigational performance. The FAA's implementation of SBAS is called the Wide-Area Augmentation System (WAAS).⁹

SA-On GPS receivers assume SA is still active. Due to design assumptions, SA-On systems experience the greatest challenge to achieving required performance under § 91.227 (NIC<0.2NM). Based on FAA monitoring of known ADS-B installations, SA-On GPS receivers currently provide rule performance availability of 95 percent or greater. This availability can be affected by the changes in the GPS constellation, which has been operated at a level well above the minimum specification defined in the GPS Standard Positioning Service (SPS) Performance Standard¹⁰.

SA-Aware GPS receivers are aware that SA is inactive. Based on FAA monitoring of known ADS-B installations, SA-Aware GPS receivers currently provide rule performance availability of 99.9 percent or greater. This availability can be affected by the changes in the GPS constellation, which has been operated at a level well above the minimum specification.¹¹

Based on FAA monitoring of known ADS-B installations, current aircraft equipped with an SBAS GPS receiver also provide rule performance with a rule performance availability of 99.9 percent or greater. In addition, SBAS GPS receivers are expected to provide the regulatory performance even if the number of satellites in the GPS constellation degraded to the minimum specified in the GPS SPS Performance Standard. At present, few SBAS GPS receivers are installed on Airbus and Boeing aircraft, but new production, regional aircraft from Bombardier and Embraer are delivered with SBAS GPS receivers.

⁸ Statement by the President Regarding the United States' Decision to Stop Degrading Global Positioning System Accuracy, May 1, 2000.

⁹ GPS receivers using SBAS are not addressed in this exemption.

¹⁰ See <u>http://www.gps.gov/technical/ps/2008-SPS-performance-standard.pdf</u>

¹¹ The effects of GPS constellation degradation are different for SA-On and SA-Aware GPS receivers. See "Report from the ADS–B Aviation Rulemaking Committee to the Federal Aviation Administration"

⁽http://www.faa.gov/nextgen/programs/adsb/media/arcReport2008.pdf)

Multi-frequency/multi-constellation receiver standards are being developed by RTCA Special Committee 159, Global Positioning System, in coordination with EUROCAE Working Groups 28, Global Navigation Satellite System (GNSS), and 62, GALILEO, as well as with the International Civil Aviation Organization's (ICAO's) Navigation System Panel. The equipment standards are planned to be completed in 2021, subject to multiple prerequisites specified in the SC-159 terms of reference, which can be found at the RTCA website (<u>www.rtca.org</u>). The rule performance availability of this equipment is expected to exceed that of SBAS equipment.

In the preamble to the ADS-B Out final rule, the FAA stated that SBAS and multifrequency/multi-constellation receivers are the only ones that provide the equivalent availability to radar using the minimum GPS constellation at the time of promulgating the rule.¹² Operators who equip with other position sources, such SA-On or SA-Aware GPS, may experience performance outages that limit their access to the airspace defined in the rule. Operators equipped with SBAS or multi-frequency/multi-constellation receivers may also experience performance outages, if there is interference to GNSS or if there is a significant degradation in one or more GNSS satellite constellation(s). During outages of GNSS (scheduled or unscheduled), the FAA expects to revert to the backup ground-based surveillance system and temporarily allow operations without ADS-B Out in required airspace. Pilots would be notified of such action via the Notice to Airmen (NOTAM) system. The FAA also expects to revert to the backup surveillance system during significant degradation in the GPS constellation, such as those that would result in performance outages for SBAS receivers.¹³

A4A's request is to allow limited relief for operations after January 1, 2020, of aircraft equipped for ADS-B Out operations, using position sources that may not provide the equivalent availability to Secondary Surveillance Radar (SSR) (99.9 percent availability). It is important to note that the aircraft affected by this exemption request are aircraft that are already equipped with GPS receivers and as discussed below, would be compliant with the regulations for a vast majority of the time.

The FAA agrees with A4A that a backup means of surveillance¹⁴ will be able to support many operations and maintain safety. However, the FAA is changing the NAS to take advantage of the improved performance of ADS-B Out, and there are circumstances where a degradation of ADS-B Out as a result of non-compliant aircraft in ADS-B Out designated airspace will have

¹² 75 Fed. Reg. 30160; 30172

¹³ Automatic Dependent Surveillance-Broadcast (ADS-B) Out Performance Requirements To Support Air Traffic (ATC) Service, Notice of Proposed Rulemaking; 72 Fed. Reg. 56947, 56959; October 5, 2007.

¹⁴ After January 1, 2020, ADS-B will be the principal means of surveillance in the United States. A backup means of surveillance may be provided by secondary surveillance radar or wide area multilateration, as these technologies have the ability to provide aircraft identification and altitude information. Other technologies may become mature which could offer the same backup capability at lower cost. Each technology has unique performance characteristics, which may also affect the separation standards that are achievable with that technology.

an operational effect on the system. ADS-B already provides surveillance coverage at lower altitudes than SSRs, and the FAA plans to decommission many of the existing terminal SSRs, which will expand the volume of airspace where ADS-B is the only means of surveillance. At higher altitudes, current separation standards are limited by SSR performance and the FAA is considering plans to reduce separation standards using ADS-B surveillance information. In addition, air traffic control (ATC) performance is affected by the accuracy of surveillance data. Finally, other aircraft that use ADS-B In for future applications may be affected by aircraft that do not meet the requirements under the rule. For these reasons, the FAA cannot accept frequent degradation of ADS-B performance.

The FAA finds that with respect to SA-aware GPS receivers, the rule performance availability using the current GPS constellation warrants that the FAA continues the planned reduction of SSRs and the implementation of air traffic improvements using ADS-B. This performance depends on the GPS constellation, which has been maintained at a level well above the U.S. commitment. Using the current GPS constellation, SA-aware GPS receivers provide rule performance availability of 99.9 percent or higher. To accommodate these aircraft in the system under the requested exemption, the FAA is effectively accepting the risk of degraded performance from SA-aware GPS receivers (if the GPS constellation is degraded). The FAA cannot, however accept this risk indefinitely. Granting an exemption that will allow operators equipped with SA-aware GPS receivers to operate when their position source performs less than that specified in the ADS-B Out rule necessitates that the FAA provide a backup means of surveillance to support air traffic operations. The FAA finds that requested exemption relief for a period not to exceed 5 years aligns with the agency's implementation plans for NextGen.

For SA-on GPS receivers using the current GPS constellation, the rule performance availability is approximately 95 percent or higher, which is not sufficient for the FAA to continue the transition in SSR systems and automation enhancements. The difference in performance was also recognized by the Equip 2020 working group and the group's recommendation was:

Operators with SA-On position sources will be required to use SAPT or an equivalent and may be required to change their flight plans if a "RAIM hole" overlaps with an SSR outage or the predicted ADS-B performance during the "RAIM hole" does not support an operation based upon ADS-B alone.¹⁵

An operator that predicts the aircraft's performance using the FAA's SAPT tool or equivalent preflight availability prediction tool¹⁶, can avoid any adverse impact to the national airspace system, as that operator would need to change its flight plan to avoid the degraded performance. For those circumstances where the FAA determines an acceptable backup

¹⁵ See ADS-B CTA 11/18/2014: Transition Period for NIC and NAC Requirements, dated December 17, 2014. ¹⁶ It has not yet been determined how enforcement of the requirement of 14 CFR 91.227(c)(1)(i) and (iii) may be handled differently if an operator utilizes a capability equivalent to that provided by the FAA.

means of surveillance is operational, the flight could continue without disrupting the NAS. The SAPT can identify predicted times/locations when rule performance is not met, and evaluate if there is another acceptable backup means of surveillance that could compensate for that performance deficit.

The FAA finds that granting the exemption would not adversely affect safety and supports the public interest. This relief is appropriate for operators that have made the early investment to equip with GPS receivers but that are limited by the lack of available product for the next generation of GPS receivers that consistently meet the rule's performance requirements. A grant of exemption would assure that the FAA's investment in NextGen is useable by operators and allows the FAA to maintain its NextGen schedule with no safety impact. The effect of the exemption is to mitigate the effects of GPS receiver performance under minimum GPS satellite constellation conditions. For an aircraft equipped with SA-Aware GPS receivers and assuming current performance of GPS is maintained, this amounts to less than two days of accumulated performance below rule requirements over the five year period which represents an acceptable risk. For an aircraft equipped with SA-On GPS receivers, this equates to approximately 90 days of accumulated performance below rule requirements, which is an unacceptable risk if operators were authorized to fly under all conditions. By restricting the times and locations to those when a preflight prediction tool affirms that an alternate method of surveillance is available, the unacceptable risk is mitigated.

Even though the requirement for ADS-B Out equipage is January 1, 2020, the FAA agrees with the petitioner that the affected operators must begin their equipment planning now and resolve any market uncertainties in order to ensure that their fleet is equipped with ADS-B Out compliant solutions by the compliance date. By waiting for a certified SBAS solution to be available for Airbus or Boeing aircraft in about 2018 (and after), which would be too late to achieve fleet-wide installation by January 1, 2020, a more workable, single-upgrade path to improved GPS receivers will emerge that will benefit the public by adding more robust performance at a lower overall cost. Therefore, the FAA finds sufficient cause to grant this exemption more than four years before the January 1, 2020 compliance date.

Absent this relief, operators would be forced to adopt currently-available receivers and accept service interruptions until upgraded equipment could be purchased and installed throughout the fleet. This would affect the public interest with respect to increased NAS costs and potential delays to passenger travel and air cargo services. Granting this exemption is in the public interest as it would help to ensure that air travel and air cargo services will not be interrupted. In order to fully realize the potential of ADS-B, the FAA cannot continue to accept the operation of ADS-B equipment which fails to meet the requirements of \$\$\$1.227(c)(1)(i) and (iii) after December 31, 2024.

The FAA has determined from the information provided that good cause exists for granting this exemption. However, as A4A is a trade association and not an operator, it cannot be granted an exemption from FAA operating requirements. Exemption from an operating rule can be granted only to affected operators. Since the affected aircraft represent a significant

portion of the air transport category fleet, it is in the public interest for the FAA to allow continued operation of the aircraft subject to certain conditions. Accordingly, the FAA will grant the relief requested by A4A to the operators of the affected aircraft when requested.

Requests for Exemption

To make this exemption effective, each affected operator must submit to the FAA a request to use this exemption and affirm its intentions to comply with the conditions and limitations of this exemption cited below. The FAA will not consider any extensions of time for this exemption beyond that granted here.

The FAA's Decision

In consideration of the foregoing, I find that a one-time, time-limited grant of exemption is in the public interest. Therefore, pursuant to the authority contained in 49 U.S. C. §§ 106(f), 40113 and 44701 delegated to me by the Administrator, aircraft operators who notify the FAA that they adopt the conditions and limitations of this decision are granted a time-limited grant of exemption from 14 CFR § 91.227(c)(1)(i) and (iii) from January 1, 2020 through December 31, 2024.

Conditions and Limitations

- 1. This exemption only applies to the aircraft that are identified by the operator in Condition No. 4.
- 2. In order to continue the operation of any aircraft subject to this exemption, each operator must create, maintain, and update a GPS equipage plan for airplanes equipped for ADS-B Out and meet the requirements of § 91.227(c) within the timeframe of relief under this exemption.
 - a. This equipage plan must be submitted to the Director, Flight Standards Service by August 1, 2018, and updated as needed, but at least annually thereafter; and
 - b. Each update must reflect increased technical and schedule confidence and details regarding each aircraft's scheduled equipage. For aircraft subject to Condition No. 4.b, more frequent updates may be appropriate as schedule installations proceed.
 - c. The operator's plan and subsequent updates will not be approved by the FAA, but must be available for review.
- 3. Prior to January 1, 2020, the operator's plan must be complete, in that it details each affected aircraft's scheduled date for compliance with 14 CFR § 91.227(c)(1)(i) and (iii).

- 4. The operator's plan must include the following elements:
 - a. Registration numbers of the affected aircraft and indication of whether Condition No. 5 (SA-Aware) or Condition No. 6 (SA-On) applies to the operation of that aircraft;
 - b. For aircraft which will be upgraded
 - i. The manufacturer, model, and part number; applicable Service Bulletin; or supplemental type certificate (STC) of the new or upgraded GPS/GNSS receiver that will replace the existing certified GPS position source;
 - ii. Upgrade schedule; and
 - iii. Interim fleet milestones, (e.g., initial installation; 30 percent, 80 percent, 100 percent completion).
 - c. For aircraft which will not be upgraded, the operator's plan for operations beyond the expiration of this exemption (e.g., planned aircraft retirement).
- 5. For operators having aircraft equipped with GPS receivers meeting the performance requirements of TSO-C196 (SA-Aware):
 - a. Compliance to TSO-C196 performance is documented by the manufacturer for a given receiver, regardless of TSO marking or authorization;
 - b. The GPS receiver must be installed in accordance with the version of AC 20-138 and AC 20-165 appropriate for that installation. The FAA will monitor the performance of each aircraft during the exemption period and, if the FAA determines that its performance is below that of a compliant and properly installed receiver, the FAA will notify the operator and may exclude that aircraft from this exemption until its performance is corrected. The FAA will make this determination using a validated model of TSO-C196 performance using a 5-degree mask angle; and
 - c. Aircraft subject to this exemption may operate in airspace specified in 14 CFR § 91.225 when their ADS-B Out equipment does not meet the requirements of § 91.227(c)(1)(i) and (iii).
 - d. The operator is not required to perform preflight availability verification.
- 6. For operators having aircraft equipped with TSO-C129-approved GPS receivers that do not meet the performance requirements of TSO-C196 or TSO-C145/-146:

- a. Compliance to TSO-C129 performance is documented by the manufacturer for a given receiver, regardless of TSO markings or authorization.
- b. The GPS receiver must comply with TSO-C129 (or TSO-C129a) and be installed in accordance with the version of AC 20-138 and AC 20-165 appropriate for that installation. The FAA will monitor the performance of each aircraft during the exemption period, and, if the FAA determines that its performance is below that of a compliant and properly installed receiver, the FAA will notify the operator and may exclude that aircraft from this exemption until its performance is corrected. The FAA will make this determination using a validated model of TSO-C129 performance using a 5-degree mask angle;
- c. Aircraft subject to this exemption may operate in airspace specified in 14CFR § 91.225when their ADS-B Out equipment does not meet the requirements of § 91.227(c)(1)(i) and (iii) and the FAA determines there is a backup means of surveillance. The FAA will provide operators with a preflight availability verification tool and information about backup means of surveillance for use in flight planning; and
- d. The operator must perform GPS preflight availability verification.

This exemption is in effect on January 1, 2020, and terminates on December 31, 2024, unless sooner superseded or rescinded.

Issued in Washington, D.C., on

/s/ Jodi S. McCarthy Director, Airspace Services Air Traffic Organization