



U.S. Department
of Transportation
**Federal Aviation
Administration**

Policy Statement

Subject: Chemical Oxygen Generator
Installations

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PS-ANM-25-04

Initiated By:
ANM-100

Summary

This policy statement provides guidance on acceptable design criteria and methods for installing chemical oxygen generators (COGs) in lavatories. Airworthiness Directive (AD) 2011-04-09 mandated that operators of certain transport category airplanes either remove the COGs or render them inoperative.¹ That AD was issued because the FAA was made aware that COGs installed in lavatories of certain transport category airplanes created a security vulnerability that could lead to a safety issue. Installations meeting this policy will require an issue paper and initial compliance findings will not be delegated.

Definition of Key Terms

In the policy statement below, the terms “must,” “should,” or “recommend” have a specific meaning that is explained in Attachment 1.

Current Regulatory and Advisory Material

Design and installation requirements for COGs are in Title 14, Code of Federal Regulations (14 CFR) 25.1450. These requirements primarily relate to protecting components surrounding the COGs from heat, marking requirements, and providing the COGs with a means to relieve internal pressure. Existing regulations do not consider the misuse of COGs but they are considered hazardous materials under Title 49 of the CFRs and are regulated in how they can be shipped.

Current regulations do not require using COGs as an oxygen source, however, their use has become common because they are smaller, weigh less, and are easier to maintain compared to other means of supplying oxygen. The minimum performance requirements for supplying

¹ AD 2011-04-09, *Airworthiness Directives; Various Transport Category Airplanes Equipped With Chemical Oxygen Generators Installed in a Lavatory* (Docket No. FAA-2011-0157, Directorate Identifier 2010-NM-261-AD).

oxygen and presenting oxygen masks are in §§ 25.1443 and 25.1447. These requirements are used to determine necessary performance of an oxygen generator as well as quantity and location of oxygen masks so that the system provides the correct oxygen supply to occupants. In the case of lavatories, there must be two oxygen masks and enough oxygen to protect two people until the airplane can descend to a suitable altitude.

Relevant Past Practice

A COG is activated by pulling on an oxygen mask. Typically, this activation method is accomplished with mechanical methods by connecting the oxygen masks to the activation mechanism on the COG. As such, COGs are typically installed in close proximity to where the oxygen will be used. In fact, the COG is often visible when the oxygen mask is in use. Because the chemical reaction generates significant heat and the surface temperature of the COGs may reach temperatures near 500 degrees Fahrenheit, a protective shroud is often installed to protect adjacent materials and prevent injury to persons that might contact it if the shroud was not installed.

Recent Rulemaking

The FAA became aware of a potential unsafe condition with COG systems installed inside the lavatories of most transport category airplanes operating as passenger air carriers. As a result, the FAA mandated that these COG systems be rendered inoperative in accordance with AD 2011-04-09, until such time as the vulnerability can be corrected. However, by rendering the oxygen systems inoperative in compliance with the actions mandated by AD 2011-04-09, operators were not in compliance with §§ 25.1447, 121.329 and 121.333. Those regulations provide the minimum requirements for supplying oxygen and presenting oxygen masks.

To address this situation, the FAA issued a special federal aviation regulation (SFAR 111) that permits, among other things, operating and delivering airplanes without complying with §§ 25.1447, 121.329 and 121.333.² The SFAR was issued as a temporary measure until new standards that address the unsafe condition could be developed. The SFAR is in effect until it is superseded by other rulemaking, so the relief it provides will continue until that time as well.

Following issuance of the SFAR, the FAA chartered an Aviation Rulemaking Committee (ARC) to recommend new standards for COG installations and an implementation strategy for those new standards that would eliminate the identified vulnerability. The ARC has completed its work and submitted a report to the FAA. That report includes recommendations and identifies the key issues involved in developing and implementing new COG standards. The FAA is processing these recommendations and intends to propose rulemaking based on them.

As part of the original AD and SFAR actions, the FAA conducted a risk analysis concerning the lack of oxygen in lavatories. The risk analysis was based on historical data and the safety consequences of not having oxygen available under various conditions. The conclusion of that assessment was that there was an approximately 5×10^{-9} /flight-hour probability of a person requiring oxygen (that is, the cabin altitude would exceed the maximum allowable altitude

² SFAR 111, *Security Considerations for Lavatory Oxygen Systems*, Docket No. FAA-2011-0186.

without oxygen) while in a lavatory. However, because there were a number of assumptions associated with this assessment, the FAA also indicated it was our intention to require the restoration of oxygen in lavatories as soon as practicable.

Currently, AD 2011-04-09 requires removing or discharging COGs in lavatories, and SFAR 111 permits operating and delivering airplanes with the COGs removed or discharged. Although the FAA is planning additional rulemaking, the policy below is being issued to encourage operators to install acceptable oxygen installations using COGs or an alternative approach as early as possible, without waiting for additional rulemaking action. The criteria outlined in this policy statement, when used, would eliminate the need for further retrofit, even after additional rulemaking is promulgated. Any reinstallation of COGs in affected lavatories would require an alternative method of compliance (AMOC) approval with respect to AD 2011-04-09.

Policy

The FAA has reviewed the ARC recommendations and believes they are sufficiently mature that we can begin approving oxygen installations in advance of rulemaking. These approvals would be in compliance with all existing regulations, but would also add provisions that make the COG installations secure, eliminating the previously identified vulnerability. The ARC formed recommendations in terms of objective, performance-based standards, rather than specific design criteria.

1. Certification Criteria

The ARC recommended that COGs have the following additional certification criteria:

Each COG or its installation must be designed to be secure by meeting one of the following conditions:

- (1) Resistance to tampering, or
- (2) A combination of resistance to tampering and active tamper-evident features, or
- (3) Installation in a location or manner whereby any attempt to access the COG would be immediately obvious, or
- (4) A combination of approaches captured in paragraphs (1), (2), or (3) above that the Administrator finds acceptable to provide a secure installation.

2. Definitions

The ARC also identified several terms that need to be defined to have a standardized application of the objective, performance-based standards. These definitions are provided below.

- **Access** - The ability to manipulate the COG for the intent of making alterations for a purpose for which the COG was not originally designed. This includes gaining access to the surrounding area next to the COG.
- **Activation** - Release of the firing mechanism of the COG for the purpose of initiating the chemical reaction inside.

- **Alteration** - A change in the configuration of the COG once “access” has been gained for the purpose of using the COG for other than its intended function.
- **COG** - chemical oxygen generator.
- **Immediately Obvious** - Where an attempt to gain “access” to the generator would be readily recognized as suspicious (prior to gaining “access”). This would only be in locations with “unrestricted access” that are “observable.”
- **Intervention** - The actions crewmembers must take to prevent damage to the airplane once an alert is activated indicating that the COG is being tampered with. The time it takes to intervene with someone in the lavatory has not been determined, however, we assume that it will take several minutes to resolve the issue.
- **Observable** - A crewmember is able to see if a person attempts to gain “access” to a COG installation during the course of the crew member’s normal duties.
- **Tamper-Evident** - A unique feature that provides an active and obvious real-time alert to crew members that someone is trying to gain “access” to the COG and immediate crew “intervention” is necessary.
- **Tamper Resistance** - The level of deterrence for gaining “access” to the COG.
- **Unrestricted access** - An area of the cabin that passengers can enter without overcoming locks or other mechanical closure means.

Operators that follow the guidance in this policy statement and have COG installations approved by the FAA will not be subject to related retrofit requirements that may later be adopted through rulemaking. Any related rulemaking the FAA proposes will include text stating that COG installations approved between the issuance of this policy statement and the adoption of a final rule that mandates any COG installation be secure (i.e., meet the requirements outlined above) will be excluded from any retrofit requirement. This applies to individual airplanes and the installation design itself, so an approved design could be used on airplanes after the effective date of a final rule. This is possible because the broad range of expertise represented on the ARC makes it unlikely that any comments received as a result of the public notice and comment process would substantively affect the retrofit designs approved on the basis of the ARC recommendations. Designs approved after the effective date of a final rule would have to comply with any retrofit requirements adopted by that final rule. This includes amendments to previously approved designs.

Using the recommended certification criteria, various approaches are acceptable, and can be applied to the COG itself, its installation, or a combination of the two. In addition, installations that do not use a COG would not be subject to the additional security considerations.

3. Additional Design Information

The ARC identified that design solutions that might be appropriate for new installations may not be feasible for retrofit installations. For COG installations, it is likely that in a large number of cases tamper resistance alone will not be feasible as a retrofit measure. An active tamper-evident system is expected to be the most costly and complex aspect of a modified COG installation for retrofit. A tamper-evident system is also likely to require additional crew training.

Another conclusion of the ARC was that the most expeditious method of restoring oxygen to lavatories might be to switch to a different oxygen system, specifically, locally stored compressed gaseous oxygen. This is primarily due to the ramifications of needing an active tamper-evident system for retrofit. However, the quantity and duration of the oxygen supply necessary for most airplane routes has historically resulted in COGs being the optimal method for supplying oxygen. Currently, no stored gaseous oxygen drop-in replacements are available.

There have been recent developments in oxygen system technologies that support new airplane programs. Applicants with these new airplane programs have assessed the dosage of oxygen required by § 25.1443 (based on tracheal partial pressure) and proposed oxygen system test methods that measure actual oxygen saturation levels in the blood. The test methods include human subject testing in an altitude chamber to substantiate performance of the oxygen system under consideration. The FAA has determined that test methods which measure blood oxygen saturation levels may be used to demonstrate that a new proposed oxygen system using the guidance in this policy statement provides an equivalent level of safety to § 25.1443. Using this approach can reduce the total quantity of oxygen required, which in turn can reduce the size of the supply source. A smaller supply source with features necessary to address the security concern may be able to fit into the existing space. However, while the concept of measuring blood oxygen saturation levels is acceptable, collecting the data necessary to show that a particular design provides an equivalent level of safety will likely require significant resources. So, this option may only be practical for design approval holders that have already collected data and can show that the data are applicable to the new lavatory oxygen system.

4. Reduced Quantity of Oxygen

Operators should also be aware that SFAR 111 does permit installing oxygen systems that do not fully comply with §§ 25.1447, 121.329 and 121.333, as long as the SFAR is in effect. Thus, an operator that wants to install a reduced quantity of oxygen in lavatories as an *interim* measure can do so using the provisions of the SFAR. All other regulatory requirements would apply, but as long as the oxygen supply was not a COG, an AMOC would not be needed for AD 2011-04-09. Operators that elect to install a reduced quantity of oxygen would be subject to related retrofit requirements that may later be adopted through rulemaking.

Effect of Policy

The general policy stated in this document does not constitute a new regulation. The FAA individual who implements policy should follow this policy when applicable to a specific project. Similarly, if the project aircraft certification office becomes aware of reasons that an applicant's proposal that meets this policy should not be approved, the office must coordinate its response with the policy issuing office.

In addition, when requested, the FAA will approve lavatory COG system installations that follow the guidance in this policy statement as an AMOC for AD 2011-04-09, until that AD is superseded to account for the new standards.

Implementation

We encourage use of this policy to enable installation of oxygen systems in lavatories in advance of rulemaking. This policy discusses compliance methods that should be applied to type certificate, amended type certificate, supplemental type certificate, and amended supplemental type certification programs. The compliance methods apply to those programs with an application date that is on or after the effective date of the final policy. If the date of application precedes the effective date of the final policy, AD 2011-04-09 still applies and for airplanes that are covered by the AD, an AMOC would be needed for any COG installation. Note that even though this policy statement is focused on lavatory COG installations, these same criteria could be used for any COG installation requiring security considerations.

Detailed methods of compliance in accordance with this policy will need to be developed in an issue paper that is coordinated with the FAA Transport Standards Staff. A multi-use issue paper may be beneficial, and is appropriate for documenting this means of compliance. Because these standards are new, and have an element of subjectivity, the FAA does not intend to delegate compliance findings until designees/delegated organizations gain sufficient experience through multiple projects.

Applicants should expect that the certifying officials will consider this information when making findings of compliance relevant to new certificate actions. In addition, as with all guidance material, this statement of policy identifies one means, but not the only means, of compliance.

Conclusion

The FAA is providing guidance on acceptable design criteria and installations for lavatory oxygen systems so operators affected by AD 2011-04-09 can install these systems without having to wait for additional FAA rulemaking.

Signed by Ali Bahrami

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Attachment

Terms

Table A-1 defines the use of key terms in this policy statement. The table describes the intended functional impact.

Table A-1 Definition of Key Terms

	Regulatory Requirements	Acceptable Methods of Compliance (MOC)	Recommendations
Language	Must	Should	Recommend
Meaning	Refers to a regulatory requirement that is mandatory for design approval	Refers to instructions for a particular MOC	Refers to a recommended practice that is optional
Functional Impact	No Design Approval if not met	Alternative MOC has to be approved by issue paper.	None, because it is optional