



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Portable Oxygen Concentrators

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Initiated by: AFS-200

1. PURPOSE. This advisory circular (AC) summarizes Federal Aviation Administration (FAA) Flight Standards Service (AFS) safety and enforcement policy about the use of portable oxygen concentrators (POC) onboard aircraft. This AC provides information to operators regarding the use of POCs onboard aircraft in order to encourage the development of voluntary POC programs to increase the accessibility of air travel by passengers with disabilities.

2. CONTENT AND AUDIENCE. This AC provides information and effective practices regarding the use of POCs. This AC is intended to be used as a resource during the development and implementation of voluntary operator programs that allow passengers to use POCs onboard aircraft. The FAA suggests that crewmembers, managers, trainers, and others associated with flight operations under Title 14 of the Code of Federal Regulations (14 CFR) parts 121, 125, and 135, use the practices identified in this AC. In addition, the FAA suggests that the procedures for an operator's voluntary POC program be incorporated in the General Operations Manual required by part 121, § 121.133; part 125, § 125.71; and part 135, § 135.21.

3. RELATED 14 CFR REGULATIONS.

- Parts 11 and 121, Special Federal Aviation Regulation (SFAR) No. 106, Rules for Use of Portable Oxygen Concentrator Systems Onboard Aircraft; Final Rule, effective August 11, 2005 (<http://dmses.dot.gov/docimages/p81/339107.pdf>), http://rgl.faa.gov/Regulatory_and_Guidance_Library/rgFinalRule.nsf/0/CB2903FB22DD67F58625703C005B2A41?OpenDocument
 - Part 121, SFAR No. 106, Rules for Use of Portable Oxygen Concentrator Systems Onboard Aircraft; amending Final Rule, effective September 12, 2006 (<http://dmses.dot.gov/docimages/p86/413671.pdf>)
 - Parts 125 and 135, Amendment SFAR No. 106, Use of Certain Portable Oxygen Concentrator Devices Onboard Aircraft; Final Rule; technical amendment, effective February 12, 2007 (<http://dmses.dot.gov/docimages/p88/435715.pdf>)
 - Part 121, §§ 121.285, 121.306, 121.574, 121.585, 121.589; part 125, §§ 125.183, 125.204, 125.219; part 135, §§ 135.87, 135.91, 135.129, 135.144, and part 382. These regulations are available online at: <http://www.gpoaccess.gov/cfr/index.html>
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- Part 382, Nondiscrimination on the Basis of Disability in Air Travel, as amended (<http://airconsumer.ost.dot.gov/rules/rules.htm>)

4. RELATED FAA GUIDANCE. This AC provides information and effective practices regarding the use of POCs and expands upon existing guidance including:

- AC 91.21-1A, Use of Portable Electronic Devices Aboard Aircraft (http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgAdvisoryCircular.nsf/0/72F58116704FC3D986256A71006ED5B0?OpenDocument&Highlight=91.21-1a)
- ANM-01-111-165, FAA Policy Statement on Certification of Power Supply Systems for Portable Electronic Devices on Part 25 Airplanes, Dated March 18, 2005 (http://www.airweb.faa.gov/Regulatory_and_Guidance_Library/rgPolicy.nsf/0/6283AF43DB9A694486256FD30077CA7D?OpenDocument&Highlight=01-111-160)

5. POCS DEFINED. POCs are small, portable devices that work by separating oxygen from nitrogen and other gasses in the air and providing the user with oxygen at a concentration of more than 90 percent. The POCs operate using either rechargeable batteries or aircraft electrical power. POCs briefly store a small quantity of oxygen until the POC either 1) senses the user's inhalation and dispenses the oxygen (pulse technology), or 2) delivers the oxygen in a continuous flow to the user. Most POCs are not considered hazardous materials by the Pipeline and Hazardous Materials Safety Administration (PHMSA), formerly the Research and Special Programs Administration (RSPA). They do not require the same level of special handling as compressed oxygen and are safe for use onboard aircraft if certain conditions for their use are met.

6. BACKGROUND.

a. On July 12, 2005, the FAA published SFAR 106 to allow the use of two specific types of POCs onboard aircraft, subject to certain conditions. The rule became effective on August 11, 2005.

b. On September 12, 2006, the FAA amended SFAR 106 to allow the use of three additional specific types of POCs onboard aircraft. The rule became effective on the same day, September 12, 2006.

c. On January 12, 2007, the FAA amended SFAR 106 to add editorial notes to parts 125 and 135 to ensure that readers know that SFAR 106 applies to operations conducted under those parts.

d. The current rule defines a POC as the AirSep Lifestyle, AirSep Freestyle, Inogen One, SeQual Eclipse, or Respironics EverGo Portable Oxygen Concentrator medical device units, as long as those medical device units:

- (1) Do not contain hazardous material as defined by the PHMSA.
- (2) Are also regulated by the Food and Drug Administration.

(3) Assist a user of medical oxygen under a doctor's care.

e. SFAR 106 does not require operators to allow the use of POCs on their aircraft. It simply allows operators to develop voluntary programs to accommodate passengers who have a medical need to use their own, or a medical oxygen service provider's POC on flights, if certain conditions are met, such as a battery packaging standard, POC stowage requirements, and some specific user responsibilities.

f. Although SFAR 106 is permissive, on September 7, 2005 the Office of the Secretary of Transportation issued a notice of proposed rulemaking that would amend 14 CFR part 382, Nondiscrimination on the Basis of Disability in Air Travel—Medical Oxygen and Portable Respiration Assistive Devices, by requiring operators to perform applicable tests of portable oxygen concentrators and, if deemed safe, to permit their use by passengers with disabilities.

7. CONSIDERATIONS REGARDING PLACEMENT AND/OR STOWAGE OF A POC.

a. In order for a POC to work efficiently, the air/intake filter must not be blocked during use. Therefore, the area around the POC should be clear of blankets, coats, and other pieces of carry-on baggage that may block the air/intake filter. If the air/intake filter is blocked, two things will occur. First, the POC user will be alerted by warning lights and/or audible alerts that the oxygen concentration in the POC output is insufficient. Second, when the temperature of the POC internal components increases to a certain limit because the POC is still trying to dispense oxygen, the POC will automatically shut down to prevent overheating of the POC and the POC user will be alerted by warning lights and/or audible alerts.

b. The POC must be placed underneath the seat in front of the POC user so that the user or the user's attendant can see the warning lights and/or hear the audible warning. Placement directly under the POC user's seat and placement in a closed compartment would prohibit the user from seeing the warning lights, as well as possibly prohibiting the user from hearing audible warnings. Other placement locations may be acceptable.

c. Some POCs are of such height that it may not be possible to stow them upright under the seat on some aircraft. For the affected POCs, the air/intake filter is protected by design from being blocked and the POC will still perform if the POC must be placed on its side to ensure proper stowage under the seat.

d. Federal regulations prohibit smoking on all scheduled passenger flight segments. However, if the operator permits smoking during the en route portion of a charter flight, then no smoking is permitted within 10 feet of any seat row where a person is using a POC.

8. POC BATTERIES. There is a user requirement in SFAR 106 § 3(b)(6) that whenever a POC user carries extra POC batteries onboard an aircraft in carry-on baggage, the user must ensure that those batteries are packaged in a manner that protects them from short circuit and physical damage.

a. Battery abuse (caused by physical damage) and battery short circuit can result in battery overheating and fire. These events, in turn, can result in personal injury to passengers, and worst case for certain types of batteries, a catastrophic passenger compartment fire. Therefore, to

ensure that all POC batteries carried onboard in carry-on baggage are protected from short circuit and physical damage, the procedures for an operator's voluntary POC program should be incorporated in the General Operations Manual required by part 121, § 121.133; part 125, § 125.71; and part 135, § 135.21 and, in addition to the applicable provisions of those sections, contain the following:

(1) Guidance on how to ensure that the user meets the battery short circuit and physical damage protection packaging requirements of SFAR 106 § 3(b)(6); and

(2) Instructions on what actions must be taken if the user fails to ensure that the battery packaging requirements of SFAR 106 § 3(b)(6) are met.

(3) Flight attendant (F/A) procedures on where and how POC users should stow properly packaged batteries to preclude damage that can be caused by other baggage.

b. POC users are responsible for ensuring that all POC batteries carried in carry-on baggage are properly packaged. POC medical service providers, some airlines, and freight forwarders specializing in small package shipments, could provide this packaging service for the POC users.

NOTE: Most of the covered POC manufacturers offer battery pack accessories that meet the battery packaging requirements in SFAR 106 § 3(b)(6).

9. PREVENTION OF ACCIDENTAL OPERATIONS. There is also a user requirement in SFAR 106 § 3(b)(6) that when a battery-powered POC is carried onboard aircraft as carry-on baggage and is not intended to be used during the flight, the battery must be removed and packaged separately unless the concentrator contains at least two effective protective features to prevent accidental operation during transport. The following examples are:

a. Include design features that shield the control panel from inadvertent contact, and

b. Have several operating procedures that require deliberate, specific actions to start the operation of the unit, which would be difficult to accomplish inadvertently, to protect against accidental operation that can result in battery overheating and fire.

10. USE OF POCS DURING THE LOSS OF CABIN PRESSURE.

a. There is no danger posed by a POC that is operating during a loss of cabin pressure. However, in the case of loss of cabin pressure (rapid or slow), POCS typically will not continue to meet the oxygen needs of the user at cabin pressure altitudes above 8,000-10,000 feet. This is because the lower ambient air pressure at higher altitudes makes the concentration of the oxygen output of the POC too low to meet the POC user's oxygen needs.

b. In cabin depressurization, the POC user should be instructed to discontinue use of the POC and use the oxygen masks that deploy to provide supplemental passenger oxygen until the aircraft descends below 10,000 feet cabin pressure altitude.

c. Passenger briefing requirements require crewmembers to instruct passengers on the necessity of using oxygen in the event of cabin depressurization. Each POC user will receive this briefing with the rest of the passengers. However, POC users who are routinely dependent on their POC as their primary source of supplemental oxygen may not recognize the limitations of their POC or that the depressurization procedures in the standard passenger briefing also apply to them. Operators may wish to emphasize this important depressurization procedure to POC users.

d. Typical operator procedures require that the aircraft rapidly descend to an altitude where supplemental oxygen use is no longer needed after a loss of cabin pressurization. However, because of limiting factors such as high terrain, the aircraft's descent may have to be halted at a minimum en route altitude resulting in the aircraft's cabin pressure altitude staying above the cabin pressure altitude at which supplemental oxygen is needed for passengers, and above the cabin pressure altitudes below which POCs have demonstrated optimum performance (typically below 8,000-10,000 feet). In this case, F/As should follow standard operating procedures regarding the use of decompression first aid oxygen when addressing the additional oxygen needs of POC users. F/As should also know that all POCs will again meet the oxygen needs of the user when the cabin pressure altitude reaches 8,000-10,000 feet or below.

11. USE OF AIRCRAFT ELECTRICAL POWER TO PROVIDE POWER TO A POC.

There is no requirement for operators to provide aircraft electrical power to a POC user. If an operator chooses to provide electrical power to a POC user, then the operator should consider the following:

a. Operators should provide policy and procedures for F/As regarding the use of aircraft power outlets in the event of battery failure and/or the POC user having an insufficient number of batteries.

b. The operator must ensure the installation and cabling, up to the point where the passenger plugs in the POC, meets the airworthiness standards of 14 CFR part 23, part 25, §§ 25.1301, 25.1309, 25.1353, and 25.1357. These sections ensure that the wiring and circuit protection are sufficient for the intended use. The sections also ensure that the POC will not negatively affect aircraft power.

c. In developing their POC programs, operators should refer to ANM-01-111-165. This policy memorandum provides guidelines for the certification of power supply systems (PSS) installed in part 25 airplanes that are intended to be used with a portable electronic device (PED). This policy does not cover the approval of the use of these devices or any interconnecting means (adapters, cords, etc.) used to power such equipment onboard an airplane. This guidance covers low voltage (e.g., nominal 15V DC) and high voltage (e.g., 110V AC, 60 Hz, 220V AC, 50 Hz) systems.

d. Most electrical outlets onboard aircraft are located in galleys, near emergency exits, and near F/A jump seats. The FAA does not prohibit a POC user from plugging a POC power cord into an aircraft electrical outlet nor does the FAA require operators to allow a POC user to plug a POC power cord into an aircraft electrical outlet. However, operators should ensure that if a POC is plugged into an outlet, the location of the outlet does not cause the POC cord to become a

tripping hazard for F/As or passengers during any phase of flight operations, including en route operations.

e. Electrical outlets onboard aircraft are considered non-essential equipment and are not required by the applicable certification or operational rules. In addition, electrical malfunctions in aircraft systems may require the power source to these outlets to be de-activated on the ground or in flight for the safety of the flight. If an electrical outlet is available, operable, and its location is appropriate for use as a POC power source, it may serve as a back up to POC batteries. In this case, the manufacturer's recommended procedures regarding the transition from battery to aircraft electrical power must be followed. In any event, POC users should never rely upon onboard aircraft electrical power being available during a flight.

12. OPERATOR'S RESPONSIBILITY. It is the operator's responsibility to acknowledge the POC user's medical oxygen needs as prescribed in the required physician's statement. SFAR 106 states that the POC user must have a written physician's statement, to be kept in that person's possession, signed by a licensed physician, that contains specific information required by the rule. The operator's responsibility is to ensure that these requirements are met, prior to allowing a passenger to use a POC onboard the aircraft.

a. **Authorized POCs.** SFAR 106 specifies that the AirSep Lifestyle, AirSep Freestyle, Inogen One, SeQual Eclipse, or Respironics EverGo are the only POCs currently authorized for use onboard an aircraft.

b. **Physician's Statement.** A physician's statement must be carried by the POC user and presented to the operator prior to POC use onboard the aircraft. SFAR 106 provides that the POC user must inform the operator that he or she intends to use a POC onboard the aircraft and must allow crewmembers to review the contents of the physician's statement. The physician's statement must contain the following information:

(1) Whether the user of the device has the physical and cognitive ability to see, hear, and understand the device's aural and visual cautions and warnings and is able, without assistance, to take the appropriate action in response to those cautions and warnings.

(2) Whether or not oxygen use is medically necessary for all or a portion of the duration of the trip. For example, during the entire flight (including aircraft ground delays, movement on the surface (taxi), takeoff, and landing), during only the en route portion of the flight, or only when needed.

(3) The maximum oxygen flow rate corresponding to the pressure in the cabin of the aircraft under normal operating conditions.

NOTE: SFAR 106 does not require POC users to have a "new" physician's statement for each flight a passenger takes. A "new" physician's statement would only be necessary if there are changes to the POC user's medical oxygen needs during air travel.

c. **Specify the Number of Batteries Required.** The POC user, whose physician statement specifies the duration of oxygen use needed by the user, must obtain from the aircraft operator,

or by other means, the duration of the planned flight. The POC user must then carry on the flight a sufficient number of batteries to power the POC for the duration of the necessary oxygen use specified in the user's physician statement, including a conservative estimate of any unanticipated delays. An operator may establish policies and guidance regarding an appropriate number of batteries needed for POC users on its flights. However, the responsibility for having a sufficient number of batteries rests squarely with the POC user.

d. Seating Restrictions for Passengers who Plan to Use a POC Onboard the Aircraft.

(1) The FAA rule regarding POCs does not establish any seating restrictions for POC users, except for the prohibition against any person using a POC occupying any seat in an exit row. The final FAA rule also requires that during movement on the surface (taxi), take off, and landing, (1) the POC must be stowed properly and (2) in such a manner that it does not restrict passenger egress to any exit or the aisle in the passenger compartment.

(2) Some seating restrictions may be necessary to comply with these FAA safety rules and several examples are presented as follows:

(a) Some seats on an aircraft, such as bulkhead seats, may or may not have approved stowage space to accommodate a POC during movement on the surface (taxi), takeoff and landing. Therefore, the POC may not be able to be stowed properly during these phases of flight if the POC user occupied those seats. In this case, a seating restriction would be required to comply with an FAA safety rule.

(b) During movement on the surface (taxi), take off, and landing, the tubing that is used to dispense oxygen from a properly stowed POC to the user's mask/nasal cannula may stretch across the row in such a way as to restrict passenger egress or become a tripping hazard in an evacuation. The POC user must not restrict another passenger's egress during these phases of flight. In this case, a seating restriction may be required to comply with an FAA safety rule.

(c) For example, if all seats in the row are occupied, the appropriate seat for the POC user would be a window seat. However, if there are no other passengers in the row, or if there is one passenger in a row of three seats and that passenger is seated in the aisle seat, or if the POC is stowed in such a way that the tubing does not block another passenger's egress, then other seats in that row may be appropriate as long as no other passenger's egress is restricted by the tubing.

(d) In essence, an operator can only establish seating restrictions based on an FAA safety rule. The examples above represent some, but not all, scenarios to consider. The operator must make a safety decision based on the specifics in an individual situation before establishing a seating restriction. A general airline policy that all passengers who board the aircraft with a POC must occupy a window seat, without regard to the specifics of the individual situation, would be inconsistent with the requirements of 14 CFR part 382 (see § 382.37(a)).

e. Advance Notice. The current provisions of part 382 do not specifically address whether operators may require 48 hours advance notice and one hour advance check-in for POC users.

f. Exemption from the Carry-on Baggage Count. The POC is an assistive device. A bag that is filled with additional batteries that are required to power the POC during the flight, could also possibly be considered an assistive device under part 382. In this case, § 382.41(d) would apply, which states that carriers shall not, in implementing their carry-on baggage policies, count toward a limit on carry-on items any assistive device brought into the cabin by a qualified individual with a disability.

13. POCS AS HAZMAT. PHMSA has carefully evaluated the POCs that currently may be used onboard an aircraft. PHMSA determined that they did not pose a hazard in transportation. Thus they do not require the same level of special handling as compressed oxygen, and are safe for use onboard aircraft provided certain conditions for their use are met. Other POCs must be similarly evaluated by PHMSA. However, a PHMSA determination that a medical oxygen device is not regulated as a hazardous material does not automatically qualify such a device as safe for use in air commerce. The FAA must review and evaluate the device to determine if there are any additional safety concerns pertaining to the use of the product onboard an aircraft. A ruling by the FAA that such a device cannot be carried onboard an aircraft does not mean that the device is a hazardous material under PHMSA's regulations in Title 49 of the Code of Federal Regulations.

14. APPROVED POCS AS CHECKED BAGGAGE.

a. PHMSA has determined that the AirSep Lifestyle, AirSep Freestyle, Inogen One, SeQual Eclipse, or Respirationics EverGo POCs do not contain hazardous material or that the hazardous material they contain is allowed in carry-on or checked baggage. However, as stated in paragraph 14b below, all spare lithium batteries must be individually protected to prevent short circuit and carried in carry-on baggage only.

b. In order to prevent accidental activation and to ensure that the batteries are adequately protected; the batteries should be removed from the POC and protected to prevent sparking and the generation of heat. Common forms of providing protection of batteries include taping of the terminals and packaging the batteries separately to prevent short circuiting. In accordance with national and international regulations governing the transportation of hazardous materials, any spare lithium batteries must be individually protected to prevent short circuiting and must be carried in carry-on baggage only.

15. ADDITIONAL TESTING REQUIREMENTS.

a. A POC is considered a medical-portable electronic device (M-PED) and is eligible to meet the standards contained in Radio Technical Commission for Aeronautics (RTCA) DO-160D or E, Environmental Conditions and Test Procedures for Airborne Equipment. POCs fall under the scope of AC 91.21-1A and each POC manufacturer can test their device to the standard called for in the AC. The requirement found in SFAR 106 § 3(a)(1) remains applicable to the aircraft operator.

b. If a POC has been previously tested on individual aircraft types and has been found not to interfere with avionics equipment, it does not have to meet the RTCA DO-160D or E, section 21 standard, if it wasn't the standard to which the POC was originally tested. Any of the test

methods described in AC 91.21-1A can be used to determine whether or not a POC will cause interference with the navigation or communication system of the aircraft on which it is used.

c. The criteria contained in RTCA DO-160, section 21, establishes safe and conservative criteria for electronic devices onboard aircraft. It also establishes protections against emitted radiation and limits “electrical noise” that manifests itself in electromagnetic interference (EMI). If this method is used to test POCs and the test results do not exceed the established criteria, no further testing is required.

d. If a POC manufacturer tests the POC to meet the RTCA standard and shows that it meets the standard, the manufacturer may provide the positive testing results to the aircraft operator. The aircraft operator must be able to show that the device has been tested and meets the applicable standard, regardless of the test method used. The aircraft operator is not required to perform additional tests.

16. TRANSPORTATION SECURITY ADMINISTRATION (TSA) REQUIREMENTS.

a. Detailed information that is pertinent to passengers regarding respiratory-related equipment (POCs) may be obtained from the following TSA website:
http://www.tsa.gov/travelers/airtravel/specialneeds/editorial_1374.shtm#2.

b. The following general security screening considerations apply to POCs:

(1) Supplemental personal medical oxygen containers/systems and other respiratory-related equipment and devices (e.g., nebulizer, respirator) are permitted through the screening checkpoint once they have undergone screening.

(2) The limit of one carry-on and one personal item (purse, briefcase or computer case) does not apply to medical supplies, equipment, mobility aids, and/or assistive devices carried by and/or used by a person with a disability.

(3) If a person has medical documentation regarding their medical condition or disability, they can present this information to the screener to help inform him or her of the person’s situation. This documentation is not required and will not exempt a person from the security screening process.

ORIGINAL SIGNED by
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