

THE AIRSEP LIFESTYLE™ PORTABLE OXYGEN CONCENTRATOR

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Several weeks prior to writing this review, I was sitting in the Detroit airport waiting to transfer between planes. As I sat, I noticed a commotion at the airline boarding podium. Being nearby, I was able to hear the subject of the controversy. The passenger was a 65-70 year-old woman who looked frail, agitated and short of breath. She had on an O₂ cannula which was hooked to an E-cylinder. Another lady, her daughter, was arguing with the head flight attendant about her mother's need to have supplemental oxygen on her flight. The attendant was adamant in her refusal to let the passenger board, maintaining that passengers are not allowed to bring pressurized gas sources aboard commercial aircraft. The attendant was saying that instead, passengers could only bring aboard oxygen from a "certified" source (at an extra cost ranging from \$25 to \$100+ per flight segment.)

I, watching all of this, noted that the passenger also had a portable concentrator with her. The daughter was saying that the E-cylinder was only to get her mom into her seat at which time she would switch her mother over to using her concentrator, with the e-cylinder going home with the daughter. The disagreement escalated and the airline attendant dug in her heels getting the passenger and daughter more agitated. Suddenly, like Mighty Mouse himself, I remembered that I actually had a copy of the new FAA O₂ regulations (14 CFR Part 382 FR/ Vol. 72, No. 172:53108-

53117 SFAR 106) in my carry-on bag (doesn't everyone?). So, with the sounds of trumpets blowing in my mind, I rose and showed the attendant the FAA regulation and information that specifically named the airline as one of those having accepted the terms of the regulations that named the concentrator the patient had. I further explained, just for her peace of mind, that her passenger's concentrator, was a low flow, low pressure device that "made" oxygen from the cabin air and was not a "bulk" high pressure oxygen container. The passenger was then allowed to board without incident.

Why tell you all of the above? Because, ironically, the concentrator in question, the concentrator the patient had that day at the airport, was the AirSep LifeStyle™ Portable Oxygen Concentrator, a draft review of which I had in my briefcase and was about to work on, during my flight – the same concentrator that is the subject of this review.



Description and Specifications

The AirSep LifeStyle Portable Concentrator is a small, compact and lightweight POC (portable oxygen concentrator) device which uses a two bed molecular sieve method to extract O₂ from environmental air. LifeStyle is a proven unit that has actually been in use since 2002. It is rated to produce 90% +/-3 % oxygen at an equivalent of 1-5 liters per minute pulsed demand delivery (the unit, then, is a concentrator and demand valved unit in one). A small on board compressor provides the pressure gradient to move the air through the sieve beds by which AirSep's PSA technology produces medical grade oxygen. As I stated, the unit is very quiet (less than 50 dBA) and would not be annoying or distracting in a home, car or airliner.

Its weight is 9.75 lb. (4.4 kg) and it has a footprint of only 5.5" h x 7.25" w x 16.3" l (13.9 cm x 18.4 cm x 41.4 cm). The unit has a 13V DC, 42-watt electrical requirement or can be powered by a 12V DC, battery pack. The power supply for battery recharging is a 100-250V AC, 50/60 Hz, 2.0 Amp unit, which can quick-charge the batteries in 2-2.5 hours. The duration between recharges of the removable battery is 50 minutes. LifeStyle can be powered by common US household current, by its 12-volt battery or by an automobile-type 12 V power supply. The LifeStyle unit both runs and recharges the 12V battery simultaneously when operating on either AC or DC power. (For air travel, clinicians and DME providers should remind their patients, however, that many airlines are not equipped to provide DC or AC power to passengers at their seats at this time.)

AirSep also offers battery pack power cords configured to work in international destinations, thus, battery charging should almost never be a problem. Additionally, 4-pin DC connectors that aircraft electrical power standards may specify are available.

When powered on, a 3-minute warm-up time is required to prime the system and charge the oxygen reservoir, which has a volume of 250 ml. The O₂ pulse is activated when the patient's inspiratory effort is sensed through a pressure drop across the O₂ supply tube. We were able to activate the pulse flow by gently



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waving the O₂ supply tube in the air; an excellent sensitivity, but yet, not over sensitive, a problem often seen in demand systems.

Controls and Alarms

There is only one control on the unit, a combined on-off switch and flow selection knob in one. The flow selection portion of the control has a range of 1-5 providing 90% O₂ at a 1-5 liter pulse, equivalent to a nasal cannula running at a regular 1-5 lpm.

There are 3 lights; red, amber and green which, in conjunction with an audible alarm, provide indications of the unit's status and proper functioning. Light and sound combinations indicate the following conditions: Start-up, Low Battery, Discharged Battery, Battery Charging, Fully Charged Battery, No Inspiration Detected (O₂ supply tube disconnect), Performance Warning, Capacity Exceeded, and General Malfunction.

Accessories

The basic unit consists of the LifeStyle, Portable Concentrator, a carrying bag (a well designed, wrap-around sweater), a padded shoulder strap which attaches to the sweater, a rechargeable battery, an AC power supply with power cord and a 12-volt DC adapter. The unit is also available with a full complement of optional accessories. These include a three-bay PowerPack™ and a AC retractable, two-wheeled, custom cart, which holds the LifeStyle unit and the PowerPack quite nicely.

Manual

The multi-language version of the Patient Manual comes as a spiral bound 5.5" x 8.5" book which contains a series of ten, 15-20 page instruction manuals. Each manual section is translated into a different language and contains the same instructions, information, tables and pictures. This is an excellent idea which should ensure a degree of international portability and understanding in terms of needed security clearances and other travel-related requirements, while addressing the needs of patients from different countries and cultures. The languages, in order of presentation are: French, German, Spanish, Greek, English, Italian, Dutch, Portuguese, Swedish, and Danish.

Not all airlines have yet "signed on" to the idea of allowing passengers to use their own oxygen concentrators on board their planes. Airlines that do allow the use of concentrators on board are: ATA–American Trans Air, ANA Airlines, Alaska Airlines, Air France, Lufthansa, British Airways, American Airlines, America West, Qantas, Colgan Air, Delta Airlines, Frontier Airlines, Hawaiian Airlines, JAL, Midwest Connect, Northwest, North American Airlines, Continental, Malaysian Airlines, Cathay Pacific, Piedmont Airlines, Southwest Airlines, Sun Country and US Airways. Airlines such as Air Canada, Continental, Northwest, West Jet, Cathay Pacific, Scandinavian Airlines and Malaysian Airlines are pending as of this review time. It should be noted that the FAA has not currently mandated that airlines allow the use of portable concentrators on their commercial aircraft. For approved POC units, the FAA guidelines indicate that RTCA DO160D-certified POC units, or those tested by the individual airlines may be allowed for onboard, in-flight use by oxygen patients carrying a valid physician prescription. The LifeStyle unit and all its power accessories have had this designation since August of 2005. Earlier LifeStyle units can be upgraded to this certification with a label designating this upgrade.

Performance Analysis

As we stated, the LifeStyle™ Portable Oxygen Concentrator delivers a bolus of oxygen on demand at the beginning of inspiration. The delivered oxygen is adjustable through settings 1-5

which, according to the manual, are equivalent to flows of 1-5 LPM of 90% oxygen. We measured the FIO₂ that would correspond to the "oral" oxygen concentration in a naso-pharynx model connected to a test lung that was driven by a rotary-drive piston ventilator to simulate spontaneous inspirations. The simulated breathing successfully elicited the oxygen bolus on inspiratory demand, as verified by audible detection of the bolus delivery. The table below gives the results of the test conditions on settings 1-5.

FIO₂ Results of LifeStyle Performance Evaluation

Conditions	Setting 1	Setting 2	Setting 3	Setting 4	Setting 5
500:12:24: -1	27 %	30 %	33 %	34 %	35 %
500:12:30: -2	23 %	25 %	27 %	29 %	31 %
700:12:60: -1	22 %	23 %	24 %	25 %	27 %
700:12:60: -5	23 %	24 %	25 %	26 %	27 %

The "conditions" column gives the VT (500 or 700 mL in our tests): breath frequency (12) BPM: peak flow (24-60 LPM): and inspiratory pressure (-1 to -5 cm H₂O) measured at the opening of the simulated naso-pharynx. The oxygen concentrations measured are the highest that occurred after stabilization.

The negative nasal pressure was varied intentionally by us in an attempt to alter the bolus volume and thus, the delivered oxygen concentration. A negative inspiratory pressure of -1 cm H₂O produced the highest oxygen concentrations while the most negative inspiratory pressure produced the lowest oxygen concentrations. This is as expected and is the case with every oxygen concentrator. What was nice about the LifeStyle however, was the fact that higher tidal volumes and faster inspiratory flow rates affected oxygen delivery somewhat, but little overall.

The unit's light indicator/alarm system shows patients that they are receiving a pulse flow on every breath with its intermittent green light display. The unit also illuminates with an intermittent yellow indicator and then audibly alarms to alert the user when the battery is near depletion. The red indicator, which can be accompanied by an audible alarm as well, signals that the cannula may be inadvertently disconnected, there is a kink in the tubing, or no breathing is otherwise detected by the unit at that time - all valuable safety features. Our tests showed that all alarms worked perfectly.

LifeStyle is certainly convenient, is very quiet during operation, and is very light-weight (the whole unit weighs less than 10 pounds). The unit is smart looking and unobtrusive and it performed to manufacturer specifications during our tests. There should be no doubt that the unit can deliver oxygen concentrations that will serve the vast majority of patients who need supplemental oxygen in any setting, especially those with active lifestyles.

Perhaps most importantly, the unit is manufactured and warranted (2 full years on the unit) by a company whose name is synonymous with air separation equipment and technology. Indeed, since the AirSep Corporation was founded 20 years ago, the corporation has grown into a worldwide entity, with product sales and support in more than 100 countries.

Homecare therapists, DME providers, hospital discharge planners and anyone in a position to recommend portable oxygen would do well to look into the LifeStyle Portable Oxygen Concentrator and/or any other device within AirSep's full line of concentrators. The company, based in Buffalo New York, can be contacted toll-free at 800-874-0202 or one can visit their extensive web-site located at www.airsep.com.