TECH NOTE

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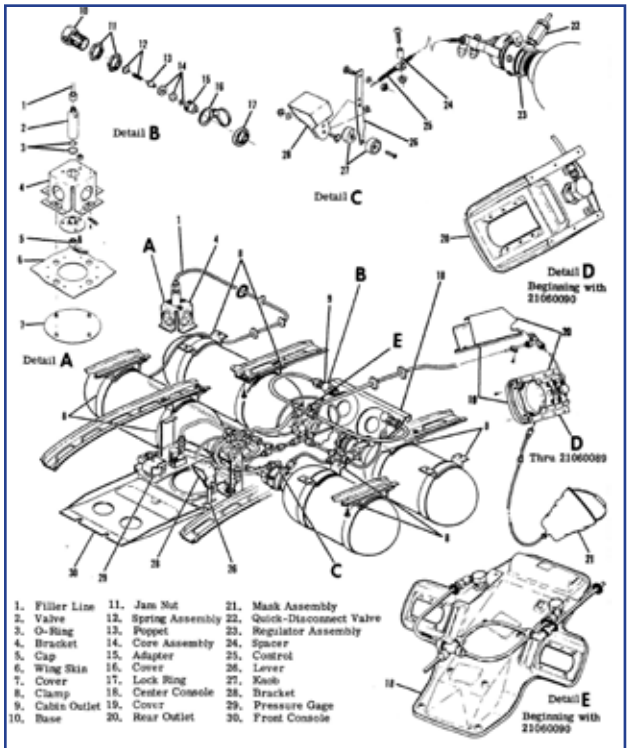
When Do Oxygen Bottles Have to Be Inspected And Retired?

Recently there have been a number of questions directed to the CPA Tech Staff concerning the inspection of oxygen bottles in aircraft and when or if certain bottles have to be retired from service. The confusion is understandable because the requirements have changed over the years and information that was printed in Cessna service manuals which was accurate when the manual was printed is now no longer accurate.

The Department of Transportation sets the inspection and retirement requirements for all high pressure gas cylinders, not just those used for aviation. There is no FAA requirement for inspection of oxygen cylinders used in aviation because there is the overriding inspection requirement for all cylinders from DOT. The FAA stated in Order 8000.40C - Maintenance of Pressure Cylinders In Use As Aircraft Equipment: "Recognizing the lack of specific FAA test data necessary to consider cylinder aging, internal corrosion, external pressure changes, cycles, and extreme temperature changes, it is logical to accept those standards developed by the DOT, RSPA (Research and Special Programs Administration) and other experts for maintaining the integrity of pressure cylinders. It follows that pressure cylinders used aboard aircraft should be maintained under the same specifications prescribed by the appropriate regulatory agency and manufacturers if no other requirements are available." These specifications, test periods and life limitations are established by the Department of Transportation Code of Federal Regulations, Title 49, Chapter 1, Paragraph 180.205 These regulations call out how often the cylinder must be sent to a certified test facility to have a hydrostatic test performed and when or if the cylinder must be retired from service. As history with these cylinders has been gained the DOT has been extending the life of the cylinders and that is why the information in the service manual may be incorrect today. Cessna communicated most of the current information to it's service centers in Service Newsletter SNL93-6 dated September 17,1993 but did not send this information on to owners.



Later Model 210 Four Bottle Oxygen System

The inspection interval and service life of a cylinder depends on the type of cylinder. The type of cylinder can be determined by numbers stamped on the cylinder. There are four types of cylinders used in Cessna aircraft.

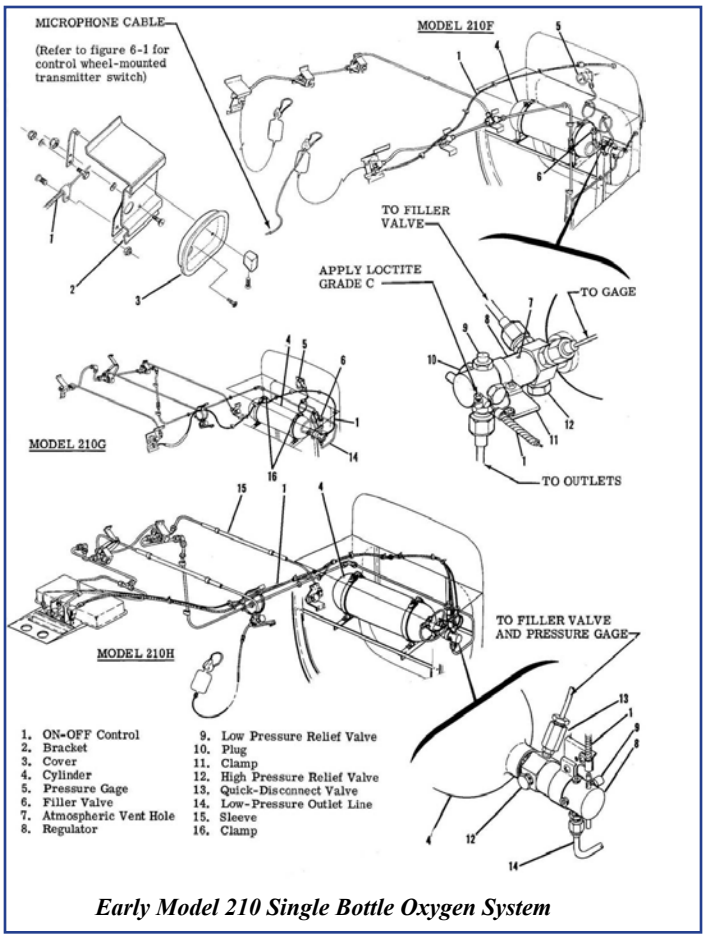
1. Standard Weight Cylinders - Made of steel these cylinders will be stamped with the numbers ICC-3AA-1800 or DOT-3AA-1800. These cylinders must receive hydrostatic inspection every FIVE YEARS. There is NO calendar or cycle LIFE LIMIT on these cylinders. This is a change from the past when these cylinders did have a service life of twelve then twenty then twenty five years. Service history has shown DOT that such limits are not necessary and that the cylinder may remain in service as long as it passes the hydrostatic tests.

2. Light Weight Cylinders - Made of high tensile steel, these cylinders will be stamped with the numbers ICC-3HT 1850 or DOT-3HT 1850. These cylinders must receive hydrostatic inspection every THREE YEARS and must be retired from service 24 YEARS after date

of manufacture. The previous life limit on these cylinders was 15 years. There is also a cycle limit on these cylinders of 4,380 cycles, to get to that number of cycles a cylinder would have to be refilled every other day for the entire 24 years so the cycle limit is not of significance in aviation use.

3. Aluminum cylinders - The first portion of the stamping on these cylinders will be ICC-3AL or DOT-3AL. Like the standard 3AA steel cylinder, the 3AL cylinder must receive hydrostatic inspection every FIVE YEARS. There is NO LIFE LIMIT>

4. Composite Cylinders - As the name implies these cylinders are made out of a composite material usually Kevlar with a wrapper bonded to the outside. These cylinders will be marked DOT-E8162 or SP8162. The composite cylinders must receive hydrostatic test every FIVE YEARS and be retired from service 15 YEARS after the date of manufacture.



Early Model 210 Single Bottle Oxygen System

What is a Hydrostatic Test?

When the oxygen cylinder is removed from the aircraft and sent to a DOT/RSPA certified technician the bottle is closely examined for any physical damage such as dents, gouges., external corrosion, etc. that could cause the bottle to fail. Damage assessment and repairs are conducted in accordance with industry and manufacturers guidelines. Next the regulator is removed and the threads of both the bottle and the regulator are inspected for damage. The regulator may or may not be functionally tested or overhauled at this time, it is not required. The bottle is inspected internally for corrosion, this is why it is a bad thing to leave an oxygen system empty, if air has been introduced into the system it is possible that moisture will condense in the bottle and cause corrosion.

Finally comes the hydrostatic test itself. The bottle is placed in a special jacket, filled with water and presurized to two thirds above it's rated pressure. The amount of expansion the bottle undergoes during the test is measured and if it exceeds a specified amount for that bottle it must be rejected. If the bottle passes all the tests and inspections it is stamped with the inspection date, painted, regulator reinstalled and is then released for return to service.

What's involved in testing the oxygen cylinder in a Cessna aircraft?

There are two elements involved in re-certifying the oxygen bottle(s) of a factory installed Cessna Oxygen System. The first element is removal and reinstallation of the bottle(s) and the second is the actual hydrostatic test.

It is in the removal and reinstallation of the bottle(s) that cost can vary signifcantly. If the aircraft has a single large bottle that is readily accessible, such as those in the early T210s where the bottle is behind a panel at the aft end of the baggage compartment or the T310Rs where the bottle is in the nose baggage compartment, you are looking at a rather simple job taking two hours or less to remove and reinstall the bottle. On the other hand if the aircraft has complicated Oxygen System such as the T210N of the late 1970s that has four small bottles mounted above the headliner requiring that the headliner be dropped to get at the bottles and that there are four bottles to be checked for leaks upon reinstallation instead of one, you are looking at a 12 to 14 man-hour job and major dollars. The guy who designed this system at Cessna really stuck it to owners whether he knows it or not.

It is important that the entire system be checked for leaks upon reinstallation, not only where the bottles are plumbed in but also at all the fixtures and fittings. A simple way to test the system to see if leaks are present is to turn on the system with a fully charged bottle, 1800 psi, but don't hook up any masks to the fixtures. If the system is good and tight the pressure loss over the course of an hour shouldn't exceed 100 psi. If the loss does exceed this figure then all the fittings and fixtures should be checked for leaks with a fluid checker. Most shops use a solution called "Snoopy" obtained

though Precise Flight, Inc., 800/547-2558, or <www.preciseflight.com>. Precise sells oxygen systems and equipment and specializes in the oxygen saving cannulas and meters. Another excellent company to work with for your oxygen system needs is Mountain High, 800/468-8185, or <www.mhoxygen.com>. CPA is hearing about more leakage at the "O" ring in the fitting that the mask hose plugs into than has been encountered in the past, probably due to age of the "O" rings. A little detection fluid on a sponge and worked into the fitting will show if this "O" ring is leaking.

The basic hydrostatic certification test generally costs between $25 and $50 a bottle and can be done by any person with DOT/RSPA certification and the proper equipment such as is found at Scuba diving shops and welding shops. Unfortunately some shops, while doing the test properly, don't take care to purge the tank of air before filling with oxygen which can lead to corrosion problems at the next inpsection even though the interior of the cylinder is Parkerized for protection against corrosion. When selecting a shop to do the test the method of purging and drying the tank should be determined.

While it isn't a requirement to have the regulator overhauled when the bottle is tested, it is not a bad idea. Five years is considered to be a pretty reasonable life for rubber seals and that is what is in the regulator. Overhauling the regulator will cost between $75 and $200 depending on the type of regulator.

When all is said and done the final costs can be as low as around $100 for a single cylinder that is easily removeable and to which only the basic hydrostatic test is done right on up to around a grand for a four bottle system above the headliner.

Portable systems

Portable oxygen systems must meet the same hydrostatic test requirements as the permanent systems. Most portable systems use the 3AA bottles that have five year inspection cycles without a retirement date.

Oxygen generators

Some pressurized Cessna aircraft utilize chemical oxygen generators instead of oxygen cylinders to supply oxygen to the crew and passengers for a brief period of time in the event of a loss of pressurization. These oxygen generators are a one time deal, once they are activated they cannot be turned off and once used must be replaced. Previously the Cessna Pilots Association had not been able to get anyone to give us a life limit figure on these canisters however after the Valujet accident in Florida we renewed our requests and have now been informed by Scott that these canisters should be removed from service after ten years. Replacement cost is $615.00 *(as of April 2009)* a canister.

OXYGEN SUPPLIER INFORMATION

AIRPORT SHOPPE
2635 Cunningham Ave.
San Jose, CA 95148
Phone: 800/634-4744
Fax:: 408/929-3726
Web: www.airportshoppe.com
E-mail: info@airportshoppe.com
Oxygen equipment, cannulas, masks, meters

AEROMEDIX
Phone: 888/362-7123
Fax:: 307/733-0032
Web: www.aeromedix.com
E-mail: info@aeromedix.com
Oxygen equipment, cannulas, masks, meters

AEROX
206 Ossipee Trail
Limingron, ME 04049
Phone: 800/237-6902
Fax:: 207/637-2329
Web: www.aerox.com
E-Mail: Aerox@aerox.com
Oxygen equipment, cannulas, masks

AVOX
(formerly Scott Aviation, is now part of the Aircraft Systems Segment of Zodiac.)
225 Erie Street
Lancaster, NY 14086
Phone: 716/683-5100
Fax : 716/681-1089
Web: www.avoxsys.com
Manufactures oxygen bottles, masks & oxygen generating canisters

C&L AERO
3076 Crossroads Dr.
Redding, CA 96003
Phone: 530/223-0667
E-Mail: claero@juno.com
Bench testing, re-certification and overhaul of valves, regulators

HRD AERO
25555 Avenue Stanford
Valencia, CA 91355
Phone: 877/473-2376
Fax:: 661/295-0672
Web: www.hrd-aerosystems.com
E-Mail: admin@hrd-aerosystems.com
FAA approved service & overhaul of bottles & regulators

PRECISE FLIGHT, INC.
(Formerly owned by Nelson Aircraft Company)
Phone: 800/547-2558
Fax : 541/388-1105
Web: www.preciseflight.com
Oxygen equipment, cannulas, masks, meters

MOUNTAIN HIGH EQUIPMENT & SUPPLY CO.
625 S.E. Salmon Ave. Ste. #2
Redmond, OR 97756
Phone: 800/468-8185
Fax : 541/923-4141
Web: www.mhoxygen.com
E-Mail: sales@mhoxygen.com
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PURITAN BENNETT AERO SYSTEMS
10800 Pflumm Road
Lenexa, KS 676215
913/338-9800
Fax 913/469-8419
Manufacturer of oxygen bottles, regulators

SKYOX
(Aircraft Industries, Inc)
27328 May ST.
Edwardsburg, MI 49112
Phone: 800/253-0800
Fax:: 269/663-2579
Web: www.skyox.com
E-Mail: sales @skyox.com
Portable oxygen systems, cannulas, flow indicators, quick disconnects, masks