

# SUPPLEMENT S004 TO THE AIRPLANE FLIGHT MANUAL DA 50 C

# **CONTINUOUS FLOW OXYGEN SYSTEM**

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# 0.2 RECORD OF REVISIONS

Rev. No.	Reason	Chap- ter	Page(s)	Date of Revision	Approval Note	Date of Approval	Date Inserted	Signature
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# Continuous Flow Oxygen System

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Continuous Flow Oxygen System

# 1. GENERAL

The DA 50 C can be equipped with an optional continuous flow oxygen system. It distributes supplemental oxygen for each pilot and passenger up to 20,000 ft.



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# 2. OPERATING LIMITATIONS

No change.



# 3. EMERGENCY PROCEDURES

# 3.6 SMOKE AND FIRE

# 3.6.5 ELECTRICAL FIRE IN FLIGHT ABOVE 10,000 FT

# **WARNING**

IN THE EVENT OF SMOKE OR FIRE, PREPARE TO LAND THE AIRPLANE WITHOUT DELAY WHILE COMPLETING FIRE SUPPRESSION AND/OR SMOKE EVACUATION PROCEDURES. IF IT CANNOT BE VISUALLY VERIFIED THAT THE FIRE HAS BEEN COMPLETELY EXTINGUISHED, WHETHER THE SMOKE HAS CLEARED OR NOT, LAND IMMEDIATELY.

1.	OXYGEN	push OFF
2.	AVIONIC MASTER	OFF

#### WARNING

SWITCHING OFF THE ELECT. MASTER WILL LEAD TO TOTAL FAILURE OF ALL ELECTRONIC AND ELECTRIC EQUIPMENT.

3.	ELECT. MASTER OFF
4.	CIRCULATING AIR FRESH AIR
5.	ECS shut-off PULL
6.	Emergency Windows OPEN if required
7.	Initiate an Emergency Descent to below 10,000 ft.
	Refer to AFM Section 3.7.5 - Emergency Descent.
8.	Perform a precautionary landing on the nearest airfield.

#### CONTINUED



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When Airplane Has Stopped

9.	Doors.																											open	
----	--------	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	------	--

10. Airplane . . . . . . . . . . . . evacuate immediately

# **END OF CHECKLIST**

# 3.7 OTHER EMERGENCIES

# 3.7.9 OXYGEN PRESSURE LOSS ABOVE 10,000 FT

#### **WARNING**

# A LEAK IN THE OXYGEN SYSTEM MAY EXCESSIVELY INCREASE THE RISK OF FIRE.

1. OXYGEN . . . . . push OFF

2. Oxygen pressure . . . . . . . . . . . . . . checked, record

3. Initiate an emergency descent.

Refer to AFM Section 3.7.5 - Emergency Descent.

4. Descent to or below altitude, where no supplemental oxygen is required.

Continue to operate not above altitude, where supplemental oxygen is required.

If Oxygen Pressure Drops, Abort Flight:

5. Land at the nearest suitable airfield.

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# 3.7.10 OXYGEN SYSTEM FAILURE (INSUFFICIENT FLOW)

# **WARNING**

# A LEAK IN THE OXYGEN SYSTEM MAY EXCESSIVELY INCREASE THE RISK OF FIRE.

1.	OXYGEN check, ON
2.	Flowmeter adjustment
If FI	ow Is Not Adjustable to Required Flow
3.	Oxygen pressure checked, record
4.	Initiate Emergency Descent.
	Refer to AFM Section 3.7.5 - Emergency Descent.
5.	Descent to or below altitude, where no supplemental oxygen is required.
	Continue to operate not above altitude, where supplemental oxygen is required.
Wh	en Passing 10,000 ft:
6.	OXYGEN push OFF
	OXYGEN check
If O	xygen Pressure Is Constant
8.	Continue flight.
If O	xygen Pressure Drops, Abort Flight:
9.	Land at the nearest suitable airfield.

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# 3.7.11 LOSS OF PRESSURE INDICATION

1. Flow and flowmeter adjustment . . . . . . . . checked

If Flow Is Adjustable and Sufficient

- 2. Continue flight.
- 3. Perform manual calculation of endurance.

If Flow Is Not Adjustable and Insufficient

4. Proceed with Section 3.7.10 - Oxygen System Failure (Insufficient Flow).



# 3A. ABNORMAL OPERATING PROCEDURES

# 3A.1 AIRPLANE-RELATED G1000 NXi CAUTIONS

### 3A.1.14 OXY PRESS LO

**OXY PRESS LO** 

**OXY PRESS LO** 

Pressure altitude is higher than 10,100 ft and Oxygen pressure is below 850 psi, followed by aural caution when dropping below 500 psi.

#### NOTE

Depending on the operating rules, supplemental oxygen is required at altitudes above 10,000 ft. This caution supports the crew to detect low oxygen pressure. If the oxygen cylinder pressure is below 850 psi and the altitude is higher than 10,100 ft, an advisory CAS message is provided to the flight crew via the G1000 NXi system, followed by aural caution signal, when the pressure drops below 500 psi. The scale range of the digital gauge between 250 and 500 psi is yellow.

As the oxygen system should not be depleted below 250 psi, the scale range of the digital gauge is red from 0 - 250 psi.

1. Depending on operating rules and flight situation, plan to reach an altitude below 10,000 ft before system is depleted below 250 psi.



# 4. NORMAL OPERATING PROCEDURES

# 4.5 CHECKLISTS FOR NORMAL OPERATING PROCEDURES

### NOTE

This supplement has been created in compliance with the requirement and rules of CS-23; limit altitude according rules of PART-NCO.

# 4.5.1 PRE-FLIGHT INSPECTION

# Outside

Inspection items of oxygen system outside of cabin:

- Open filling compartment, check clean, cap present (access hatch on RH rear fuselage tube).
- -Check filling door closed.
- Check green overboard discharge indicator disk is present (lower fin on RH rear fuselage).
- Check oxygen compartment ventilation port is clear of debris (lower fin on RH rear fuselage).

#### **CONTINUED**

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# Continuous Flow Oxygen System

# I. Cabin Check

Oxygen System:

a) Cannulas . . . . . visual inspection
b) Mask . . . . . visual inspection

#### NOTE

There must be at least one cannula for each occupant and 1 mask (type: MSK-AEM) on board. Further connection hoses for each occupant are required. The cannulas and masks must be accessible during flight.

d) Oxygen pressure . . . . . . . . . . . . . . . . check pressure, record

e) Oxygen duration chart. . . . . . . . . observe / calculate duration

(refer to Section 5.3.15 Oxygen

System Performance)

- d) a.) Turn on system.
  - b.) Check for flow on all masks/cannulas.
  - c.) Check flow meter and adjustability.
  - d.) Turn off system.
  - e.) Verify flow can be stopped.

#### NOTE

It can take several minutes before no flow is detected due to residual pressure in system.



# 4.5.21 FLIGHT ABOVE 10,000 FT USING OXYGEN SYSTEM

Before climbing above 10,000 ft:	
----------------------------------	--

١.	^											
a١	Oxygen pressure											Chack
$\alpha_I$	ONYGOTI PICOSOTIC											CHICCH

b) Cannulas Cannula, mask and hose . . . . . . adjust to face

(refer to 7.16.3 - Use of Cannulas

and Masks)

c) Delivery hose . . . . . . . . . . . . . plug into outlet assigned to seat

d) OXYGEN push/pull knob . . . . . . . . . . pull ON

#### NOTE

When the oxygen system is turned on, oxygen will flow continuously at the appropriate rate of flow selected for the altitude with minor adjustments to the needle valve thumb wheel.

e) Cannula hose flowmeter . . . . . . . . . adjust to altitude

#### **NOTE**

Standard cannulas and Oxysaver cannulas are certified for use up to 18,000 ft. Use standard masks above 18,000 ft.

#### NOTE

Check each occupant's oxygen cannula adjustment and flowmeter setting. Recheck oxygen pressure indication from time to time.

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#### NOTE

Always place the flowmeter in a position where it is in the normal scan area of the user.

### **WARNING**

SMOKING IS IN NO CASE PERMITTED IN THE DA 50 C. IT IS ESPECIALLY DANGEROUS WHILE THE OXYGEN SYSTEM IS IN USE.

# **WARNING**

THE OXYGEN SYSTEM SHOULD NOT BE DEPLETED BELOW 250 PSI. THEREFORE INITIATE DESCENT IN TIME TO REACH AN ALTTITUDE BELOW 10,000 FT BEFORE SYSTEM IS DEPLETED BELOW 250 PSI.

Flight Above 18,000 ft or Before Climbing Above 18,000 ft:

a)	Oxygen pressure	check
b)	Standard mask	adjust to face
		(change if necessary)
c)	Flow meter	adjust to altitude

## **NOTE**

With standard masks the oxygen flow is higher compared to oxysaver cannulas, which results in a lower oxygen duration (refer to Section 5.3.15 Oxygen System Performance).

#### **CONTINUED**

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After Descending Below 10,000 ft:

a)	OXYGEN push/pull knob	push OFF
b)	Delivery hose	unplug, or turn needle valve
		thumb wheel clockwise

c) Cannula, mask and hose . . . . . . . . displace from face, as required

# 5. PERFORMANCE

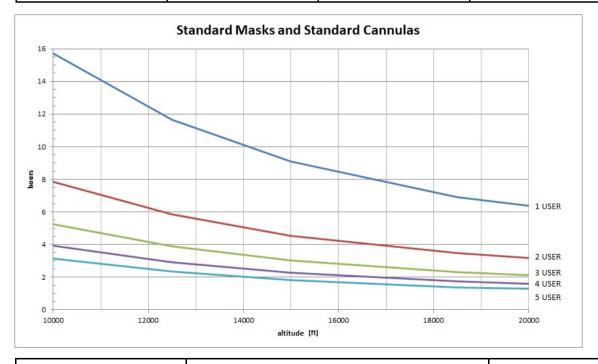
# **5.3 PERFORMANCE TABLES AND DIAGRAMS**

# **5.3.15 OXYGEN SYSTEM PERFORMANCE**

(a) Duration Quick Check Table and Diagram – Standard Masks and Standard Cannulas

Duration using standard masks and standard cannulas (hours), Oxygen cylinder filled with 1850 psi.

Number of users	10,000 ft (MSL)	15,000 ft (MSL)	20,000 ft (MSL)
1	15.5	9	6.5
2	8	4.5	3
3	5	3	2
4	4	2.5	1.5
5	3	2	1

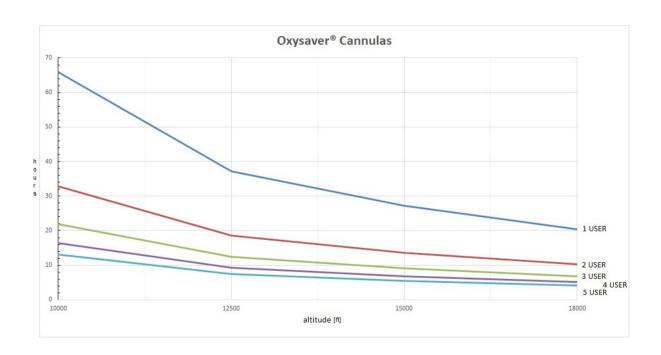




# (b) Duration Quick Check Table and Diagram – Oxysaver® Cannulas

Duration using Oxysaver® cannulas (hours), Oxygen cylinder filled with 1850 psi.

Number of users	10,000 ft (MSL)	15,000 ft (MSL)	18,000 ft (MSL)
1	66	27	20.5
2	33	13.5	10
3	22	9	7
4	16.5	7	5
5	13	5.5	4



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# (c) Exact Duration Calculation of the Oxygen System

The duration of supplying supplemental oxygen to the occupants provided by the Aerox continuous flow oxygen system depends on the following facts:

- -Oxygen cylinder pressure
- -number of users, types of dispensing equipment and individual oxygen mass flow
- -flight altitude

The exact calculation of the oxygen duration is shown below step by step:

# Step 1 - Evaluation of the Oxygen Cylinder Pressure

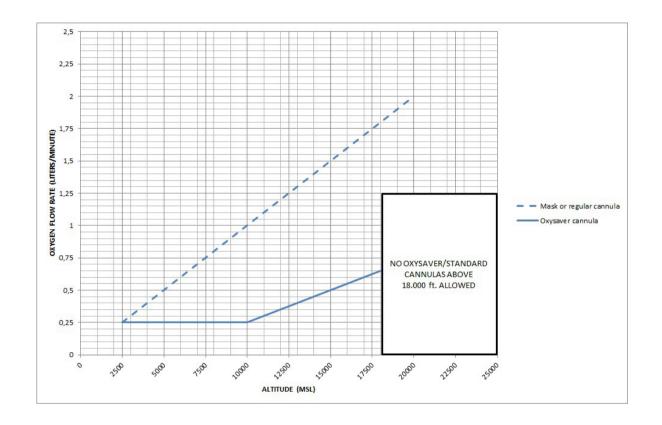
The actual oxygen cylinder pressure is indicated on the oxygen pressure gauge, one is installed in the filling compartment next to the filler port. The pressure is also indicated on the G1000 NXi system. Resultant of this pressure the oxygen pressure variable Po can be calculated:

$$P_0 = \frac{\text{Pr } essure - 250psi}{1850}$$

# Step 2 - Evaluation of the Individual Oxygen Mass Flow

The individual mass flow depends on the type of the dispensing equipment and on the expected main flight altitude:







The figure mentioned above and the table below shows the required mass flow depending on the flight altitude and the used dispensing equipment:

Main flight altitude	Mass flow [l/min] Oxysaver cannula (only up to 18,000 ft)	Mass flow [I/min] Mask or regular / standard cannula
10,000 ft	0.31	1.30
11,000 ft	0.40	1.50
12,000 ft	0.50	1.70
13,000 ft	0.55	1.85
14,000 ft	0.65	2.05
15,000 ft	0.75	2.25
16,000 ft	0.80	2.45
17,000 ft	0.90	2.65
18,000 ft	1.0	2.80
19,000 ft		3.00
20,000 ft		3.20

The mass-flow-variable Fm is calculated as shown below:

$$Fm = \frac{1}{User1 + User2 + User3 + User4 + User5}$$

"User X" is the required individual mass flow according to the chart / diagram mentioned above.

Step 3 - Final Calculation

Finally the oxygen duration is calculated as shown below:

$$P_0 \times F_m \times 23.6 = duration[hours]$$

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# (d) Example

Oxygen pressure: 1700 psi

Expected flight altitude: 16,000 ft

Number of persons on board: 3

Used dispensing equipment: 2x Oxysaver cannulas, 1 x Mask

Step 1:

$$P_0 = \frac{1700[psi] - 250[psi]}{1850[psi]} = 0.784$$

Step 2:

$$F_m = \frac{1}{0.80 + 0.80 + 2.45} = 0.2469$$

Step 3:

$$0.784 \times 0.2469 \times 23.6 = 4.5h$$

### Result:

The oxygen system is able to supply 4.5 h of supplemental oxygen to the occupants in 16,000 ft. After 4.5 h 250 psi will be left in the oxygen cylinder.



# 6. MASS AND BALANCE

# 6.4 FLIGHT MASS AND CENTER OF GRAVITY

# 6.4.1 MOMENT ARMS

The most important lever arms aft of the Datum Plane:

Item	Lever Arm	
item	[m]	[in]
Oxygen cylinder	6.21	244.5

# 6.4.3 CALCULATION OF LOADING CONDITION

When operating the airplane near the aft flight mass CG limit, note that a full oxygen tank shifts the CG approximately 6 mm (0.24 in) rear.



# 7. DESCRIPTION OF THE AIRPLANE AND ITS SYSTEMS

# 7.16 OXYGEN SYSTEM

# **7.16.1 GENERAL**

A five-place oxygen system provides the supplementary oxygen necessary for continuous flight at high altitude.

An oxygen cylinder is located in the aft fuselage in its own enclosed, vented compartment. The oxygen compartment is connected via a hose to an outlet located on the rear fin of the fuselage to provide ventilation of the compartment. A combined pressure regulator/shutoff valve attaches to the cylinder. This valve automatically reduces pressure to the delivery pressure required for the operating altitude.

The oxygen cylinder filler valve is located on the RH side of the fuselage accessible via the filling cover. The oxygen cylinder (capacity is 50.1 cubic feet / 1419 liter), may be filled to 1850 psi while installed in the airplane. A pressure gauge is located next to the filler valve to indicate the amount of oxygen in the cylinder.

The oxygen cylinder pressure is also displayed on the MFD's system/engine page of the G1000 NXi system.

In case of any overpressure in the high pressure portion of the system, a burst disc in the regulator will rupture and release all pressure via the overboard discharge line to the outside. In this case the green overboard discharge indicator is blown away from the overboard discharge assembly, located on the RH lower rear fin. Maintenance of the system is then required.

The oxygen shut-off control is located in the central overhead unit. The control cable is connected to the oxygen regulator valve with a Bowden Cable. By pulling the green control knob out the oxygen system is switched "ON". By pushing in the green control knob the oxygen supply is shut "OFF". The oxygen system should be left in the "OFF" position when not in use.

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# Continuous Flow Oxygen System

Five (5) oxygen ports, two forward for the pilot and co-pilot and three aft for the passengers, are located in the central overhead unit. The individual cannula or mask supply tubes are plug-in connected to each port and contain the individual flow adjustments (flow meter-needle valve) for each occupant. The oxygen ports are supplied directly from the oxygen regulator valve.

It is the pilot's responsibility to instruct each passenger in the use of this oxygen system prior to flight and to assure that there is adequate and comfortable supply of oxygen aboard for each occupant.

The oxygen cylinder, when fully charged, contains 50.1 cubic feet / 1419 liter of aviator's breathing oxygen under a pressure of 1850 psi at 21 °C (70 °F). Filling pressures will vary due to the ambient temperatures in the filling area and the rise of temperature resulting from the compression of the oxygen. Due to these factors merely filling the cylinder to 1850 psi will not result in a properly filled cylinder. Fill oxygen cylinder to the pressures indicated in the table shown below, based on the filling area's ambient temperature.

The oxygen system is limited to 1850 psi at 21°C (70 °F) ambient temperature.

Ambient Temperature	Max. Filling Pressure	Ambient Temperature	Ambient Temperature
[°C (°F)]	[psi]	[°C (°F)]	[°C (°F)]
4 (40)	1700	27 (80)	1880
10 (50)	1760	32 (90)	1940
16 (60)	1800	38 (100)	1980
21 (70)	1850	43 (110)	2040



# **WARNING**

OIL, GREASE OR OTHER LUBRICANTS IN CONTACT WITH OXYGEN CREATES A SERIOUS HAZARD. SUCH CONTACT MUST BE AVOIDED WHEN HANDLING OXYGEN EQUIPMENT.

# 7.16.2 OXYGEN CYLINDER PRESSURE INDICATION

On the regulator assembly in the oxygen compartment a pressure transducer is installed. It provides a voltage signal to the Garmin G1000 NXi system. The Garmin G1000 NXi system processes this signal and indicates the oxygen cylinder pressure on the MFD's engine/system page (refer to figure below). The oxygen pressure is directly related to the remaining amount of oxygen.

# (a) Indications

The following warnings and cautions are provides to the flight crew via the G1000 NXi system:

Warning/Caution	Description	Remark
Advisory	Oxygen pressure low	Pressure below 850 PSI <sup>1</sup>
Aural caution (standard tone)	Oxygen pressure low	Pressure below 500 PSI <sup>1</sup>

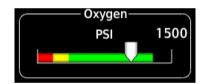
<sup>&</sup>lt;sup>1</sup> The annunciation is active when oxygen pressure is lower than 850 / 500 PSI and the pressure altitude is higher than 10,100 ft. The annunciation does automatically clear when the oxygen pressure is higher than or equal to 850 / 500 PSI.



# (b) Instrumentation

The oxygen pressure is represented with a triangular pointer in bar graph form and displayed in digital format at the right side of the above bar in white letters (refer to figure below). The display resolution is 10 PSI. All pressures are depicted in pounds per square inch (PSI). The gauge ranges are specified in the following table:

Gauge Ranges	Oxygen Pressure Range	Remark
Warning Range	0 - 250 PSI	RED numerals, RED bar
Caution Range	250 - 500 PSI	YELLOW numerals, YELLOW bar
Normal Range	500 - 1850 PSI	WHITE numerals, GREEN bar
Buffer Range	1850 - 2150 PSI	WHITE numerals, BLACK bar





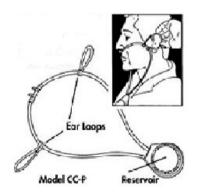
# 7.16.3 USE OF CANNULAS AND MASKS

# **Attachment and Adjustment**

a) Standard Cannulas

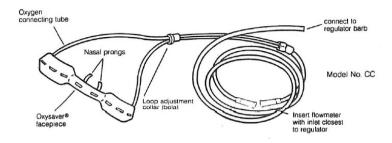


# b) Oxysaver® Cannulas – Pendant Model

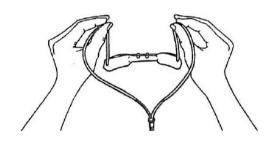




c) Oxysaver® Cannulas



1. Slide the loop adjustment collar (bola) down to enlarge the size of the loop:



2. With the back of the facepiece toward you, pick up the Oxysaver with one of the small flexible plastic tubes in each hand, as if putting on eyeglasses:





3. Place the flexible plastic tubing over your ears (as if putting on glasses) and under your chin or pass the tubing over your ears and around the back of your head:





4. The facepiece should rest on you upper lip under you nose, with the oxygen delivering prongs extending well into and pointing towards the back of your nose. You may rotate these prongs for maximum comfort.



- 5. Slide the bola up toward your chin to hold the cannula snugly and comfortably against your face.
- 6. Screw the brass hose tip onto the manifold

### **NOTE**

The use of each Oxysaver cannula system is to be logged by the hour and the system replaced with a new unit at 200 hours of use!

Use the LOG delivered with each Oxysaver cannula.

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# c) Masks

- 1. Remove the rubber band from the reservoir bag and allow it to deploy.
- 2. Attach Aerox flowmeter to the oxygen hose of mask and then to the oxygen system.

#### NOTE

The reservoir bag must be in good condition and inflated before use!

- 3. Position the bottom of the mask as low as possible under the chin while positioning the narrow portion of the mask on the bridge of the nose.
- 4. Position the cradle above the ears so that it straddles the crown of the head.
- 5. Hook the lower headband straps below the ears and around the back of the neck.
- 6. Adjust the upper headband by pulling both straps at the same time.
- 7. Adjust the lower headband straps in the same manner.
- 8. Remove the mask to adjust the straps.
- 9. Do not over-tighten the straps.





#### **NOTE**

Return mask to Aerox for service 3 years from manufacture date. Manufacture date code is located on the re-breather bag.

- 10. Plug in the microphone plug in the applicable microphone jack (type: MSK-AEM only)
- d) Flowmeter Installation/ Adjustment

#### **CAUTION**

FAILURE TO USE APPROPRIATE SCALE WILL RESULT IN INCORRECT OXYGEN CONSUMPTION.

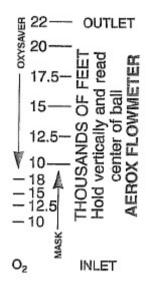
1. Connect the flowmeter between the cannula /mask tube (outlet) and the delivery hose (inlet).

#### **NOTE**

When assembling the tube to the flowmeter, only push the tube as far as the second ferrule.

- 2. Connect the cannula/mask assembly to the assigned outlet manifold.
- 3. Hold the flowmeter in vertical position and turn the needle valve screw installed on the connector counterclockwise. Adjust flowrate to current altitude by using the correct flowmeter scale.





# **NOTE**

For regular / "standard" - cannulas the "MASK" scale must be used.

# **NOTE**

When adjusted to the correct altitude the dispensing unit will deliver enough supplemental oxygen as required by "normal" people. Some people will require more oxygen. In that case adjust the flowmeter to a higher altitude.

4. Check flowmeter regularly to ensure adequate flow.



# 7.16.4 APPROVED OXYGEN

### **CAUTION**

DO NOT USE OXYGEN WITH A LOWER PURITY GRADE THAN PRESCRIBED BY MIL-PRF-27210.

# **CAUTION**

THE OXYGEN CYLINDER IS LIMITED TO A PRESSURE OF 1850 PSI AT 21°C (70°F) AMBIENT TEMPERATURE.

The AEROX continuous oxygen system uses aviator's breathing oxygen in accordance with MILPRF-27210 only.



# 7.16.5 APPROVED DISPENSING EQUIPMENT

Туре	Description	
СС	Conserving cannula Oxysaver brand (adult)	AEROX
CC-P	Conserving cannula Oxysaver brand (adult) pendant	AEROX
CR-A	Cannula regular style (adult)/ "standard"- cannula	AEROX
CR-C	Cannula regular style (child)/ "standard"- cannula	AEROX
MSK-AS	Silicone mask without microphone, (Quick Donning Type)	AEROX
MSK-AEM	Silicone mask with microphone, (Quick Donning Type)	AEROX

# **NOTE**

Each cannula and mask must be equipped with a Puritan Bennett style connector and an Aerox flowmeter (type: FM or FMNV)

#### **NOTE**

The Aerox oxygen system, installed in the DA 50 C must not be used with any other dispensing equipment.

#### NOTE

For flights up to 18,000 ft, there must be at least one cannula for each occupant and one mask (type: MSK-AEM) on board.

For flights above 18.000 ft, there must be at least one mask (type: MSK-AS or MSK-AEM) for each occupant except the pilot and one mask (type: MSK-AEM) on board.

Cannulas and masks must be accessible during flight.



# 8. AIRPLANE HANDLING, CARE AND MAINTENANCE

# **8.4 SERVICING**

# 8.4.5 REPLENISHMENT OF THE OXYGEN CYLINDER

The cannulas and masks can be cleaned with soap and water using a clean, lint-free cloth.

# **WARNING**

# DO NOT SMOKE DURING REFILLING!

a)	Oxygen gauge (G1000 NXi MFD)	check
b)	Refill cover	open

# **WARNING**

# OXYGEN IN CONJUNCTION WITH OIL WILL RESULT IN A FIRE HAZARD!

c)	Clean filling compartment and surrounding.	
d)	Refill valve cover	open
e)	Oxygen gauge (refill panel)	checked, same pressure as
		indicated on G1000 NXi MFD
f)	Filling station outlet port	connect
g)	Filling station outlet port	check fixed

#### **CONTINUED**

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# **WARNING**

USE ONLY FILTERED OXYGEN WITH A 50 MICRON FILTER. DO NOT FILL THE CYLINDER TO A PRESSURE ABOVE 1850 PSI AT 21 °C (70 °F) AMBIENT TEMPERATURE.

### DO NOT FILL AT A RATE HIGHER THAN 200 PSI/MIN.

h) Slightly open the cylinder valve of the filling station and check oxygen flow. The oxygen cylinder is limited to a pressure of 1850 psi at 21 °C (70 °F) ambient temperature.

# NOTE

Refilling of a fully depleted cylinder will take about 20 minutes at a recommended refill rate of 100 psi/min.

# When the Pressure Is Reached:

i)	Filling station valve	close
j)	Filling station outlet port	disconnect slightly
k)	Refill valve cover	fixed
I)	Oxygen gauge (refill panel)	checked, same pressure as
		indicated on G1000 NXi MFD
m)	Refill cover door	close



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