DAHER-SOCATA Customer Support

SERVICE INFORMATION

TBM700 - TBM850 - TBM900
Review of high altitude operations
2014-008

September 24, 2014

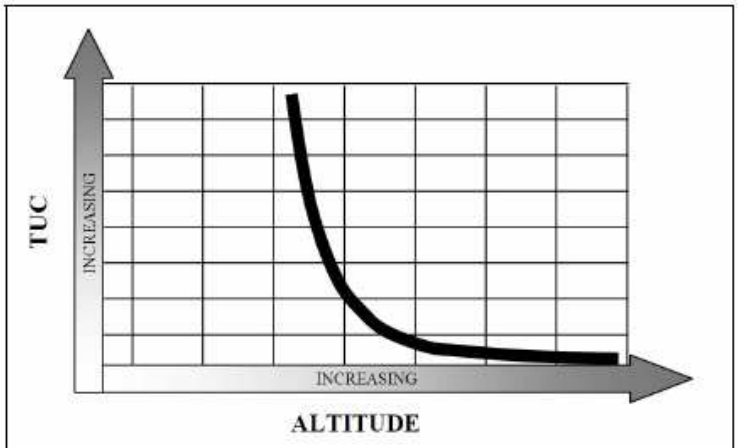
Dear Owners, Operators and Network members,

This Service Information is for general understanding and identification of resources; however, it neither supersedes nor replaces the Pilot's Operating Handbook (POH) assigned to its respective aircraft. Please refer to the appropriate POH sections applicable to your TBM. In general, this letter is addressed to the TBM fleet but examples and references provided are for the TBM 900.

Pressurization and oxygen systems are necessary because the Time of Useful Consciousness is short in high altitude:

TBM <u>Typical</u> Flight levels compared to TUC (time of useful consciousness)
Source of TUC: AC_61-107B Aircraft Operations at Altitudes Above 25,000 Feet Mean Sea Level or Mach Numbers Greater Than .75

FIGURE 2-3. TIMES OF USEFUL CONSCIOUSNESS VERSUS ALTITUDE



ALTITUDE	TUC/EPT	Following Rapid Decompression	
18,000	20–30 min	10–15 min	
22,000	10 min	5–6 min	
25,000	3–5 min	1.5–2.5 min	
28,000	2.5–3 min	1–1.5 min	TBM
30,000	1–2 min	30 s–1 min	
35,000	30 s–1 min	15–30 s	
40,000	15–20 s	Nominal	
43,000	9–12 s	Nominal	
50,000	9–12 s	Nominal	

NOTE: The above times are to be used as averages only and are based on an individual at rest. Physical activity at altitude, fatigue, self-imposed stress, and individual variation will make the times vary.

1. TBM Pressurization and Emergency Oxygen systems

The TBM pressurization and Emergency Oxygen systems have similar architectures and components to what is used worldwide on other pressurized aircraft.

These architectures have safety as their first and main priority. Fundamentally, safety is achieved through multiple layers of redundant and independent systems:

- Redundancy means there are multiple features to prevent and detect excessive cabin altitude during flight;
- Independence means these multiple features are designed so that the failure of one of them does not adversely affect the operation of the others.

As an illustration for the TBM 900:

1- Cabin pressure control is designed to maintain cabin altitude within safe and comfortable limits :

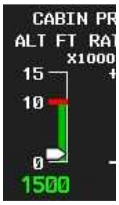
- Normal monitoring and control by the pressurization controller, based on Landing Field Elevation (LFE),

- Pressurization controller back up mode: Cabin Altitude controlled to a 9,800 ft default value

2- Maximum altitude protection that is in the Outflow valve and limits cabin altitude to 14,500 ft as long as bleed air continues to enter the cabin;

3- CABIN ALTITUDE warning indication (10,000 ft +/- 500) is independent from the above features

4- Cabin Altitude (ALT FT) indication is independent from the above features



5- Passengers masks automatic deployment is independent from all above pressurization features;

The correct operation of these systems is checked throughout the entire life of the aircraft:

- During design phase, through extensive testing, both on test benches and in flight;
- During certification phase supervised by authorities;
- During aircraft production, through quality checks, ground, and flight testing
- During aircraft operations, through the maintenance checks;
- Through continuous fleet monitoring overseen by authorities;

Emergency procedures are tested in real conditions, both during development and certification phase and for each individual aircraft prior to its licensing and leaving the factory.

2- Pressurization system

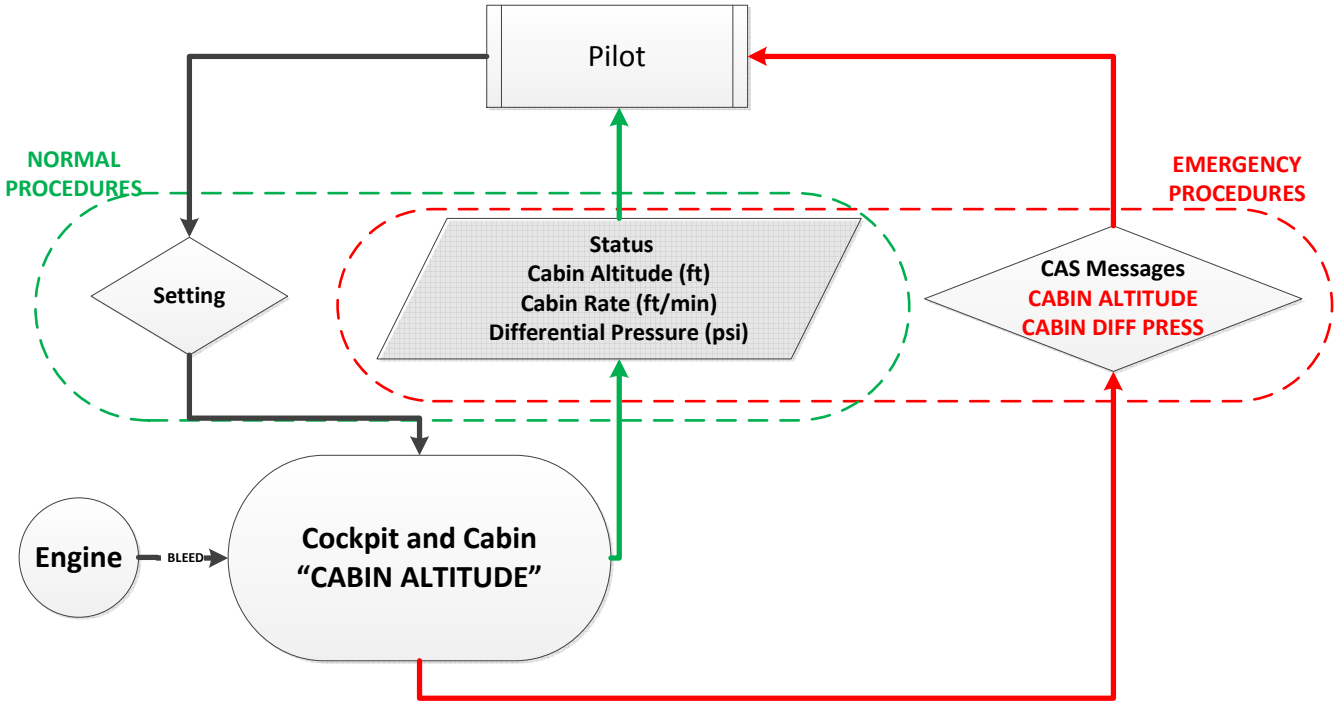
This system is designed to increase the density of the air within the airplane's cabin, (lowering the Cabin Altitude when compared to the altitude outside of the aircraft):

- It enables the people to remain on board at high altitudes without the use of supplemental oxygen;
- It provides continuous flow of fresh air to the cabin;

The pilot must monitor and react depending on the status of pressurization system;

1. Cabin Altitude
2. Cabin Rate
3. Differential Pressure
4. Master Warning associated with CAS messages: **CABIN ALTITUDE, CABIN DIFF PRESS**

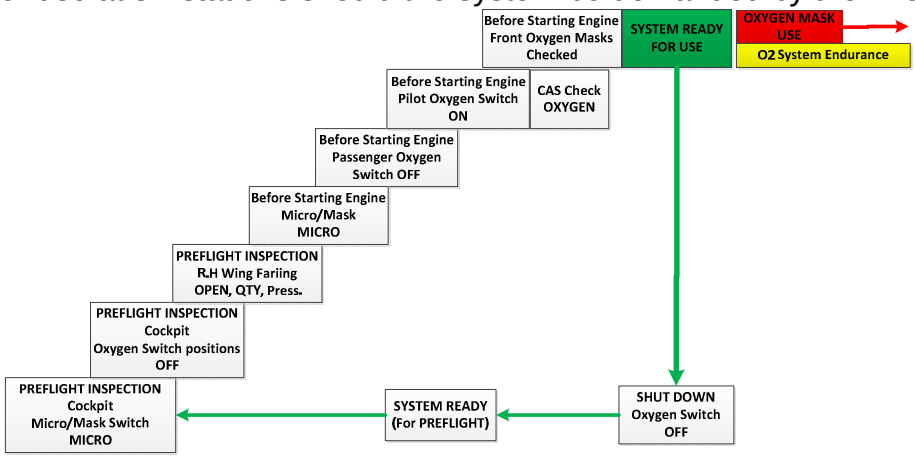
Pilot knowledge and proficiency is received via the High Altitude Endorsement training.



3- Emergency Oxygen System

The Emergency Oxygen System, onboard the TBM, is the **pressurization back-up system because of TUC**. The pilot needs to have a sufficient knowledge of this system and understand how and when to use the system. This is achieved with a thorough knowledge of POH Normal and Emergency Procedures.

Following Normal Procedures within POH Section 4 lays the building blocks that prepare the Oxygen System for use at six stations should the system be demanded by the Pilot-In-Command.



It is very important to be familiar with:

- **POH Section 4 Amplified Procedures regarding the oxygen system use**
- **Zodiac Aerospace supplemental information on the Quick Donning Mask Regulator**

SIMCOM (USA) and Airways Formation (France) can help to review all those procedures if needed.

For your convenience, please find in the next pages:

- Appendix 1: In-flight scenario of a **CABIN ALTITUDE** CAS message and the associated sequence.
- Appendix 2: Extracts of the POH Emergency Procedures, Normal Procedures, and Description (Sections 3 and 4)
- Appendix 3: Zodiac Aerospace supplemental information on the Quick Donning Mask Regulator

Fly safe,

Charlie HOLOMEK, VP Customer Support Americas

Bruno MANDON, VP Customer Support

Dedicated Contacts for this subject:

USA/Canada/Mexico/South America:
Mark DIAZ
+33631562954
m.diaz@socata.daher.com

Europe/Asia/Africa
StéphaneJACQUES
+33562417420
s.jacques@socata.daher.com

APPENDIX 1: In-flight scenario of red CAS message CABIN ALTITUDE and its associated sequence

IN-FLIGHT SCENARIO: **"CABIN ALTITUDE"** (Red CAS message)

Immediate Actions

- Don Oxygen Mask and follow OXYGEN USE Emergency Procedures (TBM 900 POH 3.9.6)
- Descent (if necessary)

Oxygen concentration may decrease rapidly. The immediate need is to obtain oxygen, followed by oxygen delivery for each occupant of the aircraft. Safety first: Don't waste time trying to analyze the situation.

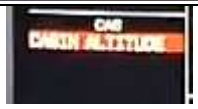
The following pictures are based on a TBM900 climb with BLEED ON and DUMP ON.

1- Before Cabin altitude exceedance

2- Exceedance indication is visible within MFD

- Alternating red/white « ALT FT »
- Red needle on analog display
- Alternating red/white Cabin altitude digital readout

3- **“CABIN ALTITUDE”** CAS message active, <u>before acknowledgment</u>

		Alternating Master Warning push button
		- Alternating red/white « CABIN ALTITUDE » CAS message - Continuous audio chime (“dong-dong”)
		- Alternating red/white « ALT FT » - Red needle on analog display - Alternating red/white Cabin altitude digital readout

4- **“CABIN ALTITUDE”** CAS message active, <u>after acknowledgment</u>

	“light off” Master Warning push button
	Stable « CABIN ALTITUDE » CAS message
 	- Alternating red/white « ALT FT » - Red needle on analog display - Alternating red/white Cabin altitude digital readout

APPENDIX 2: Extract of the TBM900 POH about Oxygen System (Section 3, 4)

The POH extracts below are given for information only.

1- Section 4 - Normal Procedures: Normal oxygen tasks that must be performed for each flight. Efficient Emergency Oxygen System performance begins with proper Normal Procedures:

Preflight Inspection: Interior Checks
- MICRO/MASK micro inverter ……MICRO
- PASSENGERS OXYGEN Switch…….OFF
- Pilot OXYGEN Switch ……OFF

Preflight Exterior Check
- Rear R.H. KARMAN
  - O2 cylinder ……..OPEN
  - Oxygen Quantity…CHECKED
  - Oxygen Pressure…CHECKED

Before Engine Start
- "PASSENGERS OXYGEN" Switch …OFF
- Pilot's "OXYGEN" switch……ON
- Front oxygen masks……Checked

After Starting Engine
- Oxygen Supply…..Available for the planned flight (see tables)

NOTE

Failure to select the pilot's "OXYGEN" switch to "ON" position prevents the following:
- Oxygen flow to the front oxygen masks and harness
- Automatic and manual deployment of passenger masks

IN-FLIGHT AVAILABLE OXYGEN QUANTITY

Oxygen pressure ..... **Read**

Outside air temperature (OAT) ..... **Read**

1 - Determine the usable oxygen percent using the chart Figure 4.4.1.

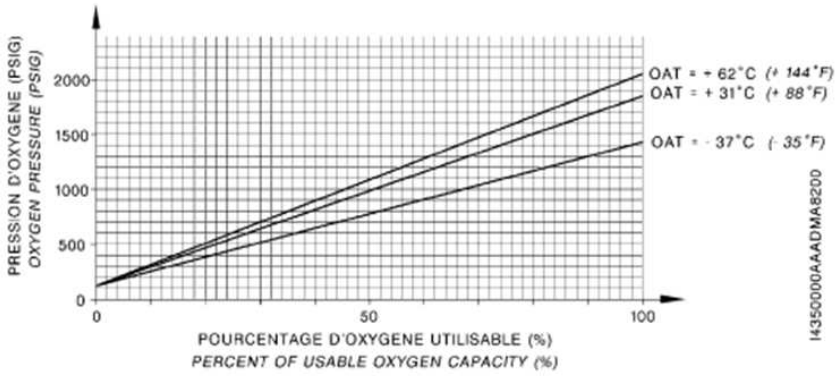


Figure 4.4.1 - Usable oxygen

2 - Determine the oxygen duration in minutes by multiplying the values read on table Figure 4.4.2 by the percent obtained with the chart Figure 4.4.1.

Number of passengers	Duration : Passengers, plus 1 pilot	Duration : Passengers, plus 2 pilots
0	226	113
1	162	94
2	127	81
3	104	71
4	88	65

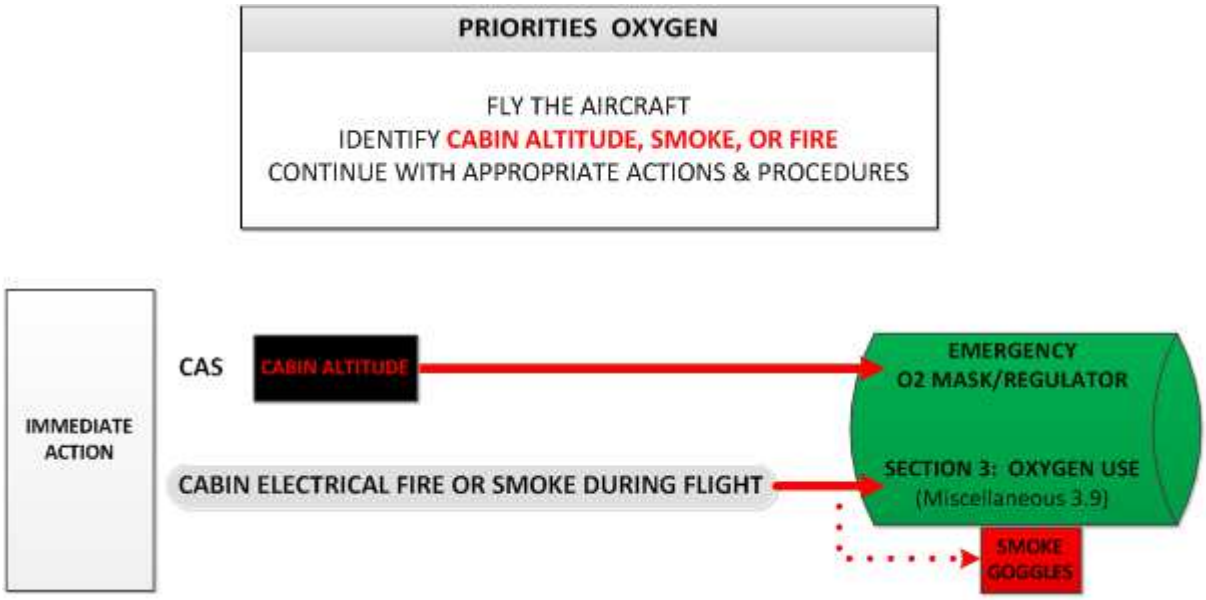
Figure 4.4.2 - Oxygen duration

Knowledge of oxygen system endurance is critical when planning longer distance flights, over inhospitable terrain and/or water, due an early descent's impact on range.

2- Section 3 – Emergency Procedures

Beyond the pilot taking the direct action of donning the Oxygen Mask/Regulator, there are two immediate action pathways into oxygen related Emergency Procedures check-lists:

1. CAS = "**CABIN ALTITUDE"**
2. CABIN ELECTRICAL FIRE OR SMOKE DURING FLIGHT



EMERGENCY Procedures (TBM 900): **OXYGEN USE**

Front seats

1 – Take a mask on the opposite seat side (pilot: R.H. side; R.H. Front passenger: L.H. side): draw it out of the stowage cup and uncoil tube totally. Press on the red side vanes to inflate the harness. Put the mask on the face.

2 - No smoke:

3-position selector NORMAL
(100 % as required)

3 - In case of smoke:

3-position selector EMERGENCY
Don the smoke goggles onto the face

4 - "PASSENGERS OXYGEN" switch ON

5 - Check the oxygen flow indicator for the front seats (the blinker is transparent) and for the rear passengers (the blinker is green).

6 - "MICRO/MASK" micro inverter MASK

7 - Perform an emergency descent to the "En route" minimum altitude and, if possible, below 10000 ft.

Passengers

1- Take a mask.

2 - Uncoil tube totally.

3 - Pull on the lanyard cord to take out the lanyard pin.

4 - Put the mask on the face

APPENDIX 3: Quick donning mask regulator MC10

Upon original delivery, each TBM is supplied with an assortment of system specific manuals. Important supplemental information related to the oxygen system is included. Please refer to the following document from Zodiac Aerospace:

> **ZODIAC AEROSPACE. AIRCRAFT SYSTEMS. OXYGEN SYSTEMS. *QUICK DONNING MASK REGULATOR MC10 –[ ] –[ ]* Series. *OPERATING AND MAINTENANCE INSTRUCTIONS.* 4NUT0045A – ISSUE 6 May 2012**

You will find important information and notes related to the donning, protection against smoke and toxic gasses, restowage of the mask-regulator, system testing, and cleaning your front oxygen masks.

Below, is an extract from Section 2 QUICK DONNING OPERATION (applicable to stowage cup MXP105):

2. QUICK DONNING OPERATION

(APPLICABLE TO THE STOWAGE CUP MXP105 AND MXP180 SERIES)

NOTE : In order to achieve five second's donning and proper operation of the quick donning mask-regulator, the personnel should be sufficiently trained in its use.

2.1.

With the mask stowed in the cup (figure 2.1) firmly grasp the regulator by the red tabs and press the inflation red tab (figure 2.2 and 2.3).

WARNING

MAKE SURE THE MASK-REGULATOR SLIDES ALONG THE SLOTS OF THE STOWAGE CUP.

NOTE : Take off the telecommunication headset; then, after donning the mask, put the headset back.

FIGURE 2.1

FIGURE 2 .2

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2.

2.2.
Pull the mask completely out of the stowage cup (figure 2.4).

2.3.
Don the mask as described in paragraphs 1.4. to 1.5.

FIGURE 2.3

FIGURE 2.4

1.

1.4.
Position the harness over the head.
Lower the mask with a wide arc from the brow to the chin (figure 1.5).

1.5.
With the mask firmly secured in the hand away from the face, release thumb or forefinger from inflation control valve (which will deflate the harness) and guide the mask assembly to the face (figure 1.6).

FIGURE 1.5

FIGURE 1.6