

## INCIDENT

<b>Aircraft Type and Registration:</b>	Cessna 404 Titan, G-OOSI	
<b>No &amp; Type of Engines:</b>	2 Continental GTSIO-520-M piston engines	
<b>Year of Manufacture:</b>	1981	
<b>Date &amp; Time (UTC):</b>	16 December 2006 at approximately 1930 hrs	
<b>Location:</b>	En-route from San Pedro Airport, Cape Verde Islands, to Dakar Airport, Senegal	
<b>Type of Flight:</b>	Private	
<b>Persons on Board:</b>	Crew - 1	Passengers - 1
<b>Injuries:</b>	Crew - None	Passengers - None
<b>Nature of Damage:</b>	None	
<b>Commander's Licence:</b>	Commercial Pilot's Licence with Instrument Rating	
<b>Commander's Age:</b>	32 years	
<b>Commander's Flying Experience:</b>	504 hours (of which 35 were on type) Last 90 days - 85 hours Last 28 days - 35 hours	
<b>Information Source:</b>	Aircraft Accident Report Form submitted by the pilot, a company report and enquiries by the AAIB	

### Introduction

The incident occurred over international waters and, in agreement with the Portuguese Authorities the AAIB, representing the State of Registration, took responsibility for the investigation.

### Synopsis

When flying above 10,000 ft, the commander did not use continuous oxygen. He was probably suffering from hypoxia when he attempted to adjust his engine controls and this resulted in vibration and an uncontrolled descent. He recovered full control at a lower altitude and made a successful diversion.

The operating company is implementing changes to their operating procedures to prevent a similar occurrence.

### History of the flight

The aircraft had been operating in the area since the end of November 2006 and was being used for map survey operations. During this time there were no reports of any significant aircraft unserviceability. The aircraft was usually operated on survey flights with two people on board: a pilot (the commander) and a camera operator (the passenger).

Prior to the incident flight, the commander had noted that his intended route from San Pedro Airport to Dakar Airport included a portion with a minimum notified altitude of FL195. He therefore planned a cruise altitude of FL210 but intended to descend below FL100 when within the Dakar FIR. The aircraft oxygen pressure indicator was showing 1,200 psi before the flight which

would allow just over four hours oxygen use for two people at FL220. The commander subsequently stated that the aircraft occupants would need oxygen for approximately 45 minutes.

There were three pilot-style oxygen masks for the two occupants. Each had a rubber restraining strap and a microphone. However, the commander was aware that the microphone on at least one of the masks was “crackly” and he didn’t intend to use it for radio transmissions. Additionally, the mask provided to the passenger had a broken strap held together with adhesive tape.

The passenger stated that a week before this flight, he was advised (by a different commander) that he should only use oxygen “as and when he needed it” to avoid any possibility of draining the system. However, the operator’s representative stated that no such instruction was necessary for the incident flight and the commander stated that he had intended the passenger to use “as much oxygen as they felt necessary”. The operator also stated that the oxygen system was serviceable and had been used on recent flights. There had been no noticeable leakage from the system and there was more than sufficient oxygen remaining for the planned flight.

For the takeoff at 1855 hrs, the passenger was seated immediately behind the commander in a seat facing aft. As the aircraft climbed through 10,000 ft, the passenger was instructed to move to the rear of the cabin, to optimise the aircraft’s CG position, and to activate the oxygen system. When seated at the rear of the cabin, the oxygen and intercom leads were too short to allow him to connect both simultaneously.

During the climb, the commander used his oxygen mask intermittently, albeit more frequently as altitude increased. When not using the mask, he placed it on his

lap. Once level at FL210 in the cruise, he engaged the autopilot. During the subsequent cruise, the passenger had the impression that the commander’s voice was “a little slurred” when transmitting to ATC. When asked, the commander confirmed that he was using oxygen and shortly afterwards he was seen to be adjusting the engine controls. The commander subsequently confirmed that he took off his oxygen mask to adjust the controls in response to a perceived engine problem. Soon after, the passenger heard a change in engine noise and was aware of vibration together with the sensation that he was being pushed into his seat. Attempts to contact the commander by intercom were unsuccessful and, with the aircraft descending at high speed and in a spiral, the passenger called twice for the commander to transmit a ‘MAYDAY’. The commander responded to the second call and declared an emergency. The aircraft was still descending and, at around 5,000 feet altitude the passenger opened the emergency escape hatch in preparation for a possible sea ditching. However, the commander then regained control of the aircraft and once it was fully stable, he requested a diversion to Amilcar Cabral Airport on the Cape Verde Islands. A safe landing was made there at 2005 hrs.

#### **Post landing actions**

After landing, the commander checked the aircraft and considered that it was fully serviceable. He was confident that the aircraft had remained within normal operating parameters during the incident and that no negative ‘g’ manoeuvres had occurred. On reflection, he considered that he had started suffering from hypoxia during the climb. The perceived engine problem probably resulted from him not correctly adjusting the engine controls at altitude.

The commander contacted his company engineer in UK to advise him of the incident and also carried out uneventful engine ground runs the next day before

flying the aircraft to Dakar Airport in daylight. At Dakar, the company engineer, who had flown out from the UK, checked the aircraft and assessed it as fully serviceable. The aircraft's oxygen contents gauge was reading 600 psi.

### **Cessna 404 oxygen system**

If an oxygen system is factory-fitted to a Cessna 404, the storage cylinder(s) are normally carried in the nose compartment. It is activated by the pilot pulling the oxygen control knob to the ON position allowing oxygen to flow from the regulator to all cabin outlets. However, the cabin of G-OOSI had been significantly modified for survey tasks and an oxygen cylinder was installed at the rear of the fuselage. The oxygen control knob was located at the rear of the aircraft cabin. Consequently, the commander had either to activate the oxygen system before takeoff or instruct passengers to activate it in the air when oxygen was required.

A normally closed valve in each oxygen outlet is opened by inserting the connector of a mask and hose assembly. The front-seat oxygen outlet was under the armrest beside the commander's seat, adjacent to the headphone and microphone jack sockets. The passengers' oxygen connector at the rear of the cabin was above his head within a small panel containing lights and a ventilation outlet. This panel did not have adjacent headphone and microphone jack sockets.

The Pilot's Operating Handbook contains an aircraft altitude operating limitation of 30,000 ft with oxygen equipment.

### **Regulations**

All aircraft must fly at an altitude less than 10,000 ft unless the aircraft has a pressurised cabin or the pilot uses an individual oxygen source supplied by a personal

mask. Additionally, it is recommended that oxygen be used at a lower altitude when flying at night.

### **Pilot's assessment**

After the incident, the pilot stated that although he was aware of the insidious nature of hypoxia, and despite his attempts to recognise the symptoms during the flight, he under-estimated the risks of becoming hypoxic through not wearing the oxygen mask continuously.

### **Company actions**

The company concluded that the main contributing factor to the incident was the commander not using his oxygen mask continuously above 10,000 ft. Another contributing factor was that at least one of the oxygen masks on the aircraft may have had a defective microphone; this would have required the user to remove the mask when communicating with ATC.

The company intends to implement more stringent hypoxia training and is also making the following changes to their procedures:

1. Future annual flight checks for all company pilots will include a briefing on the use of the aircraft oxygen system.
2. When operating abroad, crews will be required to inform the Chief Pilot or Company Safety Pilot whenever equipment is unserviceable.
3. Camera operators will be required to attend initial company CRM courses.
4. Night flights in unpressurised aircraft will be prohibited above 10,000 ft.

In view of these actions, the AAIB did not make any safety recommendations.