

CASA Medevac Operations Proof of Concept in the Southern Indian Ocean Zone

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- BACKGROUND:** Air medical evacuations by tactical aircraft are mandatory in every country, particularly in deployments abroad where hospital resources are limited. In the overseas French departments, it can be particularly useful for military and civilian scientists stationed on the very remote islands of the French Southern and Antarctic Lands. This priority medical support mission uses fixed wing CASA CN235 aircraft and is led by the French Air Force and the French Military Medical Service, in cooperation with the civilian health service.
- CASE REPORT:** The authors present the case of a French soldier with chest trauma on an isolated island who benefited from continuum of care during his air evacuation to Reunion Island.
- DISCUSSION:** This case illustrates that the “CASA Medevac” concept has become a crucial link in the French medical evacuation chain in remote areas. The complex organization, the human material resources, and, finally, the training program are briefly presented.
- KEYWORDS:** emergency, French Military Medical Service, medevac, prolonged field care, telemedicine, ultrasound.

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Air medical evacuations (medevacs) with a fixed wing tactical aircraft (CASA CN235) are the main mission of medical teams of the French Armed Forces in the southern Indian Ocean zone (FAZSOI) stationed on Reunion Island. Over a large maritime area of responsibility (representing 10 times that of France), they support military and civilian scientists stationed on the very remote islands of the French Southern and Antarctic Lands (TAAF). Through this case report, the authors present the specific organization and the means implemented for the benefit of medevac activity in the French southern Indian Ocean zone. They illustrate that the “CASA Medevac” concept, initially implemented within the armed conflict in the Sahel in 2013, is effective.

CASE STUDY

A 23-yr-old military patient, on a 6-wk mission on the remote island of Juan de Nova, suffered (in January 2020) from trauma to the right hemithorax after a fall of 1.50 m during a workout session. The camp nurse, after satellite telemedicine consultation with a military referent physician stationed at Saint-Pierre, Reunion Island, gave level II analgesics and

nonsteroidal anti-inflammatory drugs. The next day, during further telemedicine consultation, the development of slight dyspnea and right thoracic subcutaneous emphysema was noticed. An air medical evacuation by a fixed wing tactical aircraft (CASA CN235) of the French Air Force stationed at Saint-Denis, Reunion Island, was requested. Upon the arrival of the medevac team, the examination showed an absence of respiratory distress with a respiratory rate of 12/min and 100% S_pO_2 on room air, stable hemodynamics with an arterial pressure of 113/59 mmHg and heart rate at 68/min, and pain rated at 4/10 and apyrexia. On the right chest, a hematoma and subcutaneous emphysema next to the lateral arch of ribs 8 to 10, without deformation or flap, were noticed. There was also thoracic asymmetry, a decrease in the

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vesicular murmur in the right pulmonary field, and crackling and rumbling rales in the right base. A Focused Assessment Sonography of Trauma (FAST) exam was performed, showing signs of a right hemopneumothorax (lack of pleural sliding at the right pulmonary apex and right base fluid collection). It was decided not to drain this hemopneumothorax in the absence of severity criteria (unfavorable benefit/risk ratio in very isolated conditions) and to carry out the air transport with cabin pressurization at zero altitude. The patient was installed in a semiseated position, placed on oxygen therapy by nasal cannula at $2 \text{ L} \cdot \text{min}^{-1}$, and infused through a peripheral venous route in order to continue the treatment of pain with paracetamol and low titrating doses of morphine. Preparation of an exsufflation catheter, chest drainage kit, and sedation drugs were anticipated. The intervention doctor then contacted the island referent doctor to relay the assessment to the civilian emergency service regulation center (SAMU 974) and report before takeoff. After discussions with the CASA pilots, the pressurization conditions were specified, requiring prior refueling on the island. The patient was stable during the 4-h flight to Reunion Island and was then transferred to the emergency service of the Saint-Denis University Hospital. The chest X-ray confirmed a right hemothorax and an incomplete pneumothorax (Fig. 1). After effective drainage and a few days of monitoring, the patient went back to his regiment in France.

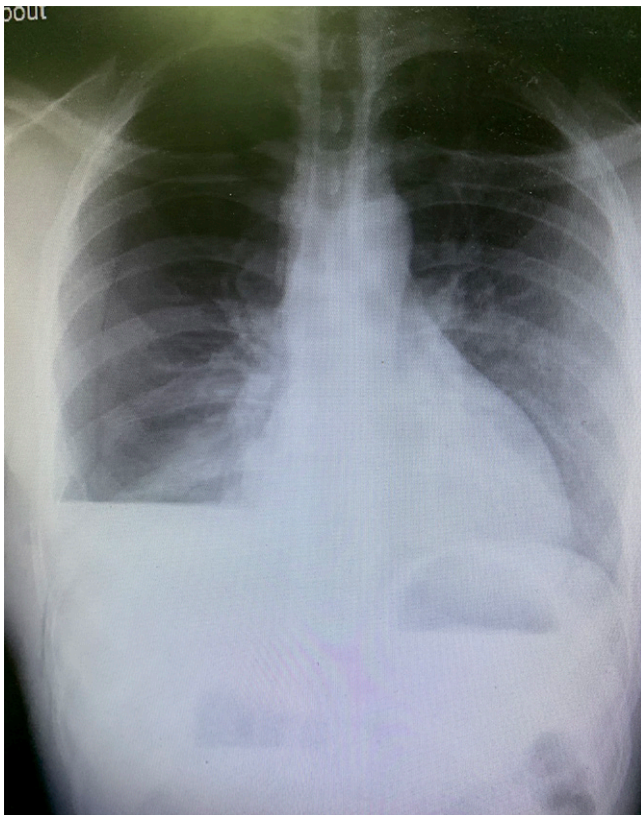


Fig. 1. Chest X-ray showing a right hemothorax and an incomplete pneumothorax.

DISCUSSION

The Permanent Area of Responsibility of the FAZSOI is particularly wide, comprising 14 countries (10 Southern African countries and 4 Indian Ocean Commission countries). It is also characterized by the presence of 11 islands belonging to the TAAF, with a permanent presence of a military detachment on the remote islands of Juan de Nova, Europa, and Glorieuses (Fig. 2).⁵ The “CASA Medevac” concept has been performed in the southern Indian Ocean since 2015. This way of air medical evacuations by fixed wing tactical aircraft (CASA CN235) has shown its effectiveness in carrying the wounded over medium distances after 8 yr of operational commitment in the Sahel.^{4,9,10} From field care to the mainland military hospital, the wounded benefit from uninterrupted, high-quality care, despite the austere environment.^{2,7,11} The characteristics of the CASA CN 235 (range = 3500 km, speed = 240 kn or 450 km/h or 280 mph, maximum altitude = 7500 m or 25,000 ft, landing on summary runways with a front line of less than 1000 m, offered load capacity of 6000 kg, pressurization, electricity, etc.) make it a particularly suitable vector for medevac missions in remote areas. This is a satisfactory agreement between cost and efficiency.

Two CASA CN235-300 aircraft are stationed on Reunion Island and carry out a variety of missions, including transporting freight and passengers, airborne drops, maritime surveillance, etc. The French Air Force 50th Transport Squadron stationed at the 181st Air Base on Saint-Denis Reunion Island and medical teams from the French Military Medical Service are capable of implementing medevac modules for the benefit of French soldiers, French civilians, or by special request of foreign countries in the area of responsibility. Activity is quite variable, with an average of 6.2 ± 4.6 medevac tactics per year between 2000 and 2020. The breakdown by type of pathology reveals 49% trauma, 45% medicine, and 6% psychiatry.

A 24/7 medevac alert from Saint-Denis can be relocated to Mayotte in case of a hurricane on Reunion Island. Notice to move is 4 h for taking off, day and night. The CASA Medevac crew consists of two pilots, one flight mechanic, and a flight medical team, including one emergency physician and

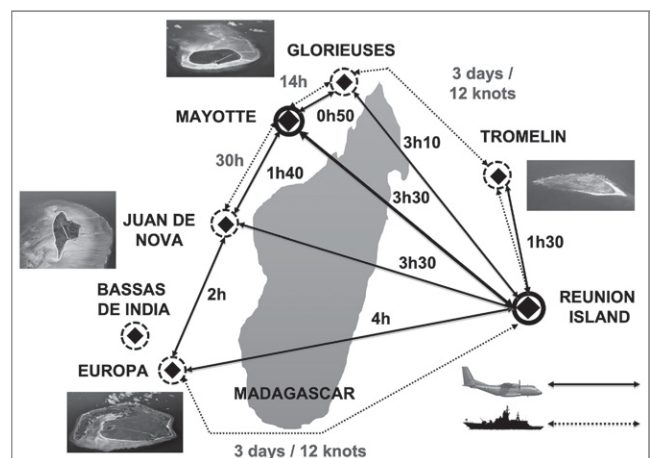


Fig. 2. Air and sea evacuation time in the French southern Indian Ocean zone.

one nurse. The medevac medical equipment and supplies are stored at the aeromedical center on the 181st Air Base. This kit was initially elaborated in 2016 on the model of the one deployed in Mali.⁴ It weighed about 330 kg, including drugs, French lyophilized plasma, 3600 L of oxygen, and infusion pumps, vacuum cleaner, defibrillator, multiparametric monitoring monitor, and respirator (which can be recharged in flight). The capacity of care is two littered patients, including one requiring intensive care.

Organization of a mission

Coordination between the civilian health service, especially hospitals and Emergency Medical Services ambulances, and FAZSOI, including the crew and medical team, is a key point. A military nurse is deployed on each French island. He/she can refer to a referent physician based on Reunion Island for advice or prescription by telemedicine, including video consultation. In case of emergency, this military doctor can make the decision for an evacuation. He/she must, in that case, send a patient medevac request to the FAZSOI headquarters to launch the medevac procedure and warn the Reunion Island Emergency Medical Service Regulation Center (SAMU 974).

Casualty survival depends on the continuity and adequacy of care provided by the entire medical chain to which Medevac CASA belongs. The military medical team conducts their duty before (reassessment, packaging, and loading) and during the flight. They must perform a set of emergency diagnostic and therapeutic actions (monitoring, perfusion, intubation, vasopressors, sedation, early transfusion...) to take advantage of the long evacuation time to continue resuscitation.^{4,7,13} In this particular case, FAST ultrasound scanning was useful for an accurate diagnosis of pneumothorax and is mandatory nowadays for out-of-hospital medical assessment in emergency medicine.^{3,12,14} Flight strength needs anticipation and a good coordination between the medical team and pilots. In this case, zero cabin pressurization was required.^{4,7,8}

Tromelin is a very remote island 600 km north of Reunion Island, 1600 m long and 700 m wide. Scientists employed by TAAF are stationed all year long, including a nurse with a referent medical doctor with telemedicine capability. An airstrip can welcome military aircraft, but it has not been used in 3 yr.⁵ Indeed, on this protected site, an endemic population of birds, such as the “fous de bassan,” have grown dramatically after a program of eradication of nonendemic predators, such as rats. Nowadays, millions of birds ban aircraft from landing day and night. The last solution is a sea medevac with military ships from Reunion Island, which take between 24 and 36 h to reach Tromelin.

In case of emergency, the paratrooper military medical team of Saint-Pierre can reach Tromelin with CASA CN235 aircraft within 5 h (4 h notice to move and 1 h of flight) in order to reduce the delay to access intensive care. This team, including an emergency medical doctor and a nurse qualified for high-altitude high opening and high-altitude low opening jumps, can come for intensive care, such as blood product transfusion,

thrombolysis for cardiovascular accidents, etc. The Tamarin exercise in December 2020 validated this medical concept, which could be applied anywhere in the remote environment of the area of responsibility, including Africa.

Training

Military doctors and nurses arriving at Reunion Island have a 3-d course organized by the aeromedical center on the 181st Air Base, including in-flight scenarios, classes, and return of experience.^{1,6} This allows them to be more familiar with the aircraft, flight restrictions, and air medical kit. Nurses deployed on the remote islands of Juan de Nova, Europa, and Glorieuses also have a 3-d course about remote medicine and telemedicine.

Conclusion

Air medical evacuations with fixed wing tactical aircraft are an efficient solution in the context of long-range deployments with many small teams. In the French Indian Ocean territories, in particular for the benefit of military and civilians stationed on the scattered islands of the TAAF, this mission remains more than ever a priority for the French Military Medical Service. Through a clinical case, the authors illustrate the “CASA Medevac” concept in prolonged field care which has become a crucial link in the French medical evacuation chain in remote areas. A rigorous organization, good cooperation with pilots, and continuing training in prehospital care and emergency medicine are mandatory for the medical team to maintain optimal quality of care and the autonomy of the French Military Medical Service in the health component of the FAZSOI operational contract.

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Erratum

An error was introduced into the final version of the article:

Gougeon K, Yasukawa K, Baudet A. Barodontalgia and dental barotrauma among scuba divers. *Aerosp Med Hum Perform*. 2022; 93(5):421–425.

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The first author of this article is **Kévin Gougeon, DDS**. The first author's name was incorrectly spelled as Kougeon throughout the article and in the table of contents. We sincerely apologize for the error. Please note this on any postings or indices of this article.