

## Air MEDEVAC in case of multiple casualties – The experience of civilian-military cooperation in RoAF

Dragoş C. Tudose<sup>1</sup>, Daniel Nică<sup>1</sup>

**Abstract:** *Introduction: Starting September 2010 in Romania was created the Military Emergency Medical Service (SMMU) by the Ministry of National Defense, which has as main mission to provide first aid and save the lives of military personnel during military operations using special equipped MEDEVAC aircraft. Nationwide exist the national emergency system which operates thru 112- SMURD acting in support of the civilian population. In case of accidents with multiple victims the experience has shown the need for collaboration between the two systems, in order to save lives. In the last 5 years there has been an increasing Airlift missions (MEDEVAC) with multiple victims executed by joint civil-military medical teams using military aircraft.*

*Material and methods. This paper provides a review of the most important aspects of particularities, advantages and disadvantages of this type of medical transport using the MEDEVAC missions based study carried out by the Air Force in recent years.*

*Results and conclusions. Performing these tasks presents challenges to mission planning, use of medical equipment and procedures, command-control system, exercise programs jointly joint medical teams and, of course, managing a large number of patients in flight.*

*The large number of patients transported safely and in the shortest time, regardless of weather conditions recommends this type of medical intervention.*

*Given the Romanian military presence in various theaters and that NATO strategic medical evacuation is a national responsibility, the capacity of air transport in case multiple casualties is a priority.*

**Keywords:** *RoAF, flight surgeon, in flight medical care, multiple casualty, interoperability, cooperation, joint civil-military medical teams*

### INTRODUCTION

Starting September 2010 in Romania the Military Emergency Medical Service (SMMU) was created by the Ministry of National Defense, which has as main mission to provide first aid and save the lives of military personnel during military operations using special equipped MEDEVAC aircraft. Nationwide exist the national emergency system which operates thru 112 emergency number – SMURD (Serviciul Mobil de

Urgență, Reanimare și Descarcerare; Mobile Emergency Service for Resuscitation and Extrication) acting in support of the civilian population. In case of accidents with multiple victims the experience has shown the need for collaboration between the two systems, in order to save lives. In the last 5 years there has been an increasing Aeromedical evacuation missions (AME - MEDEVAC) with multiple victims

<sup>1</sup>90<sup>th</sup> Airlift Base Romanian, Romanian Air Forces

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This paper provides a review of the most important aspects of particularities, advantages and disadvantages of this type of medical transport using the MEDEVAC missions based study carried out by the Romanian Air Force in recent years.

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In this modern time beside the classical war conflict we are facing more and more new challenges like mass causality due to terrorist attacks, car accidents, fire and explosions in our civilian day by day life.

Due to financial and personnel restraints, neither one of the 2 system, civilian or military one, can properly face by itself this kind of incidents and it's just a question of time until the number of patients will overwhelm the capability and capacity of each system.

In Romania 2 systems coexist for Aeromedical Evacuation: the civilian SMURD (Mobile Emergency Service for Resuscitation and Extrication) using 8 EC135 helicopter and 1 Piper PA-42 Cheyenne III airplane and the military system under de MoD/RoAF command with 6 IAR 330 Puma helicopters and 1 C27J Spartan airplane. The drawback of the civilian system is that there aircraft don't fly at night and in severe meteorological condition. In the military one we don't have enough emergency medical personnel to cover 24/7. So this is the basis on which we start cooperation.

Due to the fact that national evacuation it's a civilian responsibility the military AME assets may be used to

augment civil capability in 2 ways: Military aircraft assets with civilian medical crew and Military aircraft assets with mixed civilian-military medical crew.

Military aircraft used in this type of missions are:

- IAR 330 Puma MEDEVAC helicopter: fully equipped as an intensive care unit can carry up to 3 critically ill patient, in all-weather condition day or night with a range of 500 km;



- C130 Hercules has a maximum capacity of 74 stretchers with a range of 2000 km and have been use for years for CASEVAC missions from Iraq and Afghanistan;



- C27 Spartan: the newest and most modern aircraft from RoAF fleet can carry maximum 24 stretchers with autonomy of 6 hours and 2500 km. The characteristic of this aircraft is the possibility of carry 2 special ICU modules with dedicated monitor, ventilator and O2 capability.

Another characteristic is the MEDEVAC pressurization mode in which the aircraft will maintain the cabin pressure at ground level until flight level 130 (4000 m) in order decrease the hypobaric stress on the patient.



The last 6 years statistics show that from a total of 53 MEDEVAC missions with RoAF aircraft 15 (28.31%) where missions with multiple patients with a total of 100 patients (72.46%). The vast majority of this missions were made with C27J Spartan (12 – 80%), 2 with C130 Hercules (13.33%) and only 1 using helicopters (6.66%). That can be explained by the fact that the IAR 330 Puma helicopters can carry only 3 stretcher patient but at this load the space is severely limited. Another factor was the meteorological condition. This type of mission with multiple patients is used on longer distances (more than 300 km) and this is why the fix wing aircraft are used more (speed and distance advantages).

Messaging and alerts: because the civilian medical system can't put on alert the RoAF assets the messaging system goes like this: when somewhere in Romania an accident is happening the initial receiving medical facility contact the secondary or tertiary medical center if the complexity of the injury require a higher level of medical treatment. If the patients or patients are accepted for transfer then the medical coordinator of SMURD send an aeromedical evacuation request to CNMC (National Command Military Centre) who pass it to RoAF COA (Air Operation Component). At this level the Aeromedical Evacuation Officer have an up-to date image of the position, availability and the response time of each aircraft. The decision is made about which type of aircraft (airplane or helicopter) shall be used and the alert message is scrambled.

The particularity of multiple air MEDEVAC mission is that because the number of patients and the diversity of pathology the necessary medical equipment and the component of the medical team on board must

be carefully planned on very short notice.

The military medical crew consists normally in 1 or 2 flight surgeons (medical officer, permanent working in an air base, having 1 year course in emergency medicine, 6 month training in aviation medicine, fit to fly according with the medical standards of the National Institute of Aviation Medicine) and 2 to 4 flight nurses (3 years degree in nursing after graduating Nurse College, 6 month training in emergency medicine, fit to fly) but in case of multiple cases this crew can or must be updated with ICU specialist or neonatologist accordingly to the medical need (in June 2012 MEDEVAC mission from Bucharest, ROU to Hanover, DEU with 3 children from 7 day to 3 years old with cardiac malformations in with the crew was upgraded with 1 neonatologist and 2 nurses beside the flight surgeon and the flight nurse from RoAF).

In term of medical equipment due to the national standardization there are no compatibility problems in term of coupling power tension or O<sub>2</sub> pressure. The only real challenge is how to be able to get all the necessary equipment in time and in the right quantity (in July 2008 after a explosion in a Gheorghieni local wood factory we accomplished a MEDEVAC mission for 10 severely burn patients, 2nd 3rd and 4th degree burns, all respiratory assisted and mechanically ventilated so the problem was how to have 10 ventilators and 10 multifunction monitors in that plane in less than 2 hours.)

### **AEROMEDICAL ASPECTS**

Hypoxia is the greatest threat to anyone flying. Physiological effects of hypoxemia can be detected in healthy individuals at lower altitudes of 3000 m but more rapidly in certain patients. It occurs due to changes in ambient pressure. Cabin pressurization reduce this problem especially airplanes, but patients with respiratory failure may be at risk for hypoxemia current cabin altitude achieved. Adjusting the fraction of inspired oxygen to maintain the partial pressure of inspired oxygen constant throughout the mission is a technique useful clinically for prevention of hypoxemia. The wide availability of pulseoximeter decreased incidence of hypoxemia in the MEDEVAC

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missions with early recognition.

**Accelerations:** Acceleration or deceleration is a vector quantity, having both magnitude and direction. For this reason, the correct positioning of the patient in the idea to limit acceleration-induced forces sustained should be carried out. Acceleration forces that are experienced in helicopters or planes during routine operations (due to flight techniques and procedures ensuring low range of acceleration forces during MEDEVAC missions) tend to be small in size or as great as those observed in terrestrial transport vehicles.

**Volume of gas:** ambient pressure decreases with increasing altitude. Pressure changes with altitude and the change can affect a number of medical devices and patients. Contrary to common belief, cabin pressurization does not eliminate the problem. Pressurization allows a comfortable flight altitude manned which could not otherwise be achieved, but in general, not altitude from sea level, and thus, the equipment and the patient will be exposed to a pressure change. Any gas enclosed in a structure therefore becomes a concern. Air trapped in the sinuses, for example, can expand and cause discomfort and equipment (air-filled cuffs) can be damaged or can injure patient with the change altitudes.

**Humidity:** Humidity is a particular concern in fixed-wing missions because cabin air is taken from the rarefied atmosphere outside, and even in pressurized aircraft and when heated may contain very little moisture. This can lead to dryness and discomfort of the patient secretions during flight.

**Noise:** Modern aircraft produce quite a lot of noise. In most aircraft cabins is pretty quiet for conversation and patient evaluation but cabins of helicopters are so loud that exclude pulmonary auscultation. Soundproofed helmets and intercom systems are

needed.

**Vibration:** Vibration is a form of repetitive alternative motion. The two major sources of vibration during MEDEVAC missions are powerplant and turbulence of the air moving aircraft. The vibrations cause discomfort and fatigue to patients and also to medical team, and are transmitted to medical equipment in flight and can be the source of errors and monitoring failures.

## **CONCLUSION**

The Multiple victim accidents are a REALITY and the transport of those patients to an adequate level of care facility is a NECESSITY. Air medical transport put additional stress on patients (fear of flying, physical discomfort), on medical staff (unconventional and insufficient workspace with great limitation regarding medical equipment and medication and the impossibility to receive advice and expertise) and on medical equipment (operating in a vibration, pressure and temperature differential environment). Influence appears to be greater for the transport helicopters and in case of multiple patients.

Air medical evacuation missions with multiple victims require: rigorous planning, exercises (based on realistic scenarios) and resources (time, money, personnel, equipment).

Romanian Air Force aircraft equipped MEDEVAC are on alert 24/7 and the training of medical staff allow prompt intervention in case of accidents with multiple victims;

Civil-military intervention can be a solution for those situations, on the condition of legislation harmonization in order to provide fast and efficient mobilization of resources and cooperation between military and civilian institutions.