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Guide to Air Ambulance Operations

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Foreword

This Guide to Air Ambulance Operations has been prepared by Certification Standards Division (AARXC) to provide information and guidance material for the use of air operators, government agencies, medical institutions and others engaged in the transport of medical patients by air. This Guide is intended to be advisory in nature.

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1.0 PURPOSE

This publication provides information and guidance material for the use of air operators, government agencies, medical institutions, and others engaged in the transport of medical patients by air. It is intended to be advisory in nature and in all cases the applicable *Canadian Aviation Regulations*, Air Operator Certificates, the Airworthiness Manual etc. take precedence.

2.0 DEFINITION

The term “air ambulance” will be used throughout this application to refer to the transport of medical patients by air.

3.0 BACKGROUND

The geography and population distribution of Canada have led naturally to the extensive use of air ambulances. It is estimated that some 30,000 patients are moved by air each year. Almost every province and territory utilizes some type of air ambulance service, ranging from regularly scheduled air operators to dedicated aircraft with custom-built interiors and advanced life-support equipment. As medical budgets are stretched ever thinner and the cost of specialized equipment continues to increase, the practice of moving patients to higher level care facilities will likely become more commonplace. Unfortunately, rapid growth in any field, particularly one as complex as aviation, can often lead to a lowering of standards unless properly monitored. Although an air ambulance flight is, in theory, no different from any other transport flight there are a number of unique aspects which require special consideration by both the air operator and the controlling or contracting agency. Many of these lie outside the responsibility of Transport Canada, Civil Aviation (TC) and will only be referred to in this document in their relationship to aviation safety. Medical information has been provided by Health Canada and is included for reference only.

It is hoped that the information contained in this document will help those responsible for the planning and operational control of air ambulance systems in their task of providing the safest and most effective service possible.

4.0 REGULATIONS

An air ambulance service is considered by TC to be a commercial air service except where the service is wholly owned and operated by a government agency and there is no direct

charge to the patient. Commercial air services are regulated by Part VII, *Canadian Aviation Regulations*.

There is no requirement for an air operator to have an amendment to Operations Specification to operate an air ambulance service, unless a deviation from the *Canadian Aviation Regulations (CAR)* is desired. The following is a possible Operations Specification which may be required concerning Alternate Airport – IFR Weather Minima.

5.0 DANGEROUS GOODS AUTHORITY

Air ambulances are subject to the *Transportation of Dangerous Goods Act, 1992* and the *Transportation of Dangerous Goods Regulations*.

When an air ambulance transports dangerous goods without a patient the full requirements of the *Act* and *Regulations* apply.

When an air ambulance transports dangerous goods to provide, during flight, medical aid to a patient certain exemptions from the *Act* and *Regulations* apply, see subsection 2.9(2) of the *Transportation of Dangerous Goods Regulations* and section 1;1.1.2 of the International Civil Aviation Organization Technical Instructions.

When a patient brings a medical article for personal use, including articles containing oxygen, on board as carry-on baggage that article is exempt from the *Act* and *Regulations*, see paragraph 2.3(f) of the *Transportation of Dangerous Goods Regulations*.

Where compressed oxygen or air cylinders are integral to the aircraft configuration such installations shall be approved by the appropriate regional airworthiness authority.

6.0 OPERATIONAL PROCEDURES

The Company Operations Manual should contain reference to the following as applicable for aircraft type:

- (a) Communications procedures for the air ambulance flight watch; (if applicable)
- (b) Approved method of restraining a stretcher or incubator, patient and any medical equipment transported;
- (c) Stretcher or incubator installation;
- (d) Patient orientation relative to the aircraft axis;
- (e) Operational procedures as applicable to each type of aircraft;
- (f) Medical attendant's duties and responsibilities;

- (g) Assignment of person responsible to restraint stretcher or incubator, patient and any required medical equipment in the aircraft;
- (h) Assignment of a pilot to assist passengers in the cabin in the event of an emergency evacuation or in-flight incident involving fire or smoke in the cabin, or any incident threatening the safety of the aircraft or its occupant if a cabin attendant is not carried;
- (i) Assignment of a crew member to ensure the safety of passengers and others approaching and department a helicopter when the rotors are turning;
- (j) Procedures to ensure the following are conducted prior to flight;
 - (i) Pre-flight briefing to include information on seatbelts, emergency exits, main door operation, life-jackets, passenger safety card location, and use of cabin light switches;
 - (ii) A visual check to ensure adequacy of stretcher or incubator installation and restraint, as well as patient restraint;
 - (iii) A visual check to ensure any required medical equipment is adequately restrained;
 - (iv) Procedures respecting completion of pre-takeoff and pre-landing cabin checks by a crew member;
 - (v) Procedures respecting the stowage of carry-on baggage, equipment and cargo to ensure compliance with section 602.86, Part VI, *Canadian Aviation Regulations*;
 - (vi) Evacuation procedures should be established for:
 - The evacuation of patient removed from stretcher;
 - The evacuation of patient whose injuries prevent his/her release from stretcher. Criteria shall be established for each aircraft type to determine if a patient and stretcher can easily be evacuated from each exit on that aircraft; and
 - Evacuation of incubator;
 - (vii) If it is determined that the incubator or stretcher will not fit through any one exit, such information shall be contained in the company *Operations Manual* and shall be included in the pre-flight briefing.

7.0 PERSONNEL

Pilots – All pilot qualifications are established by TC and are based on aircraft type. Pilots employed by air operators are also required to undergo specified training on a periodic basis as directed by the *Canadian Aviation Regulations*. Although most air ambulance flights are routine transfers of stabilized patients to higher care facilities, some are urgent

missions with life or death consequences often conducted at night or in marginal weather. These types of operations place a great deal of stress on pilots, who require mature judgment to avoid allowing their sense of mission accomplishment to override this reason. Agencies contracting for air ambulance services may wish to specify requirements over and above the minimum required by regulation such as two pilots on all flights, additional training and experience, and the requirement for the air operator to maintain an approved list of those pilots authorized to fly aircraft supplied under the contract.

Medical Attendants – There are no *Canadian Aviation Regulations* specifying the conditions under which a medical attendant must be carried. Similarly, TC has no jurisdiction over the qualifications or training of medical attendants. The provincial authority or contracting agency should establish standards for medical personnel and clearly define the criteria for their employment. It is recommended that all air ambulance flights carry a flight or medical attendant. A medical attendant should be an able bodied person physically capable of assisting the patient to an exit in the event of an emergency and who will attend to the personal needs of the patient in flight.

There is often some confusion regarding the status of medical attendants and their responsibilities relating to the operation of the aircraft. It should be clearly understood that medical attendants are not normally crew members under the *Canadian Aviation Regulations*. They may be designated as crew members provided they receive approved flight attendant training. In this case, medical attendants may be assigned duties such as passenger briefing, evacuation, and look-out for helicopter landings, otherwise these functions remain the responsibility of the flight crew.

Training in the aviation environment is desirable for medical personnel involved in air ambulance operations. Depending on whether the attendant is part of a dedicated service or accompanies patients on an occasional basis this training will likely vary in length, but should at least include familiarity with the following:

- (a) Meteorological weather conditions;
- (b) Hypoxia;
- (c) Hyperventilation;
- (d) Effects of scuba diving;
- (e) Effects of smoking and drugs;
- (f) Hypothermia;
- (g) G forces: positive and negative;
- (h) Principles of protection against G force in an emergency landing or ditching;
- (i) Patient evacuation;
- (j) Turbulence problems with patient seat belt and traction devices;
- (k) Effects of noise and vibration on the ill or injured;

- (l) Difficulties encountered using “common” medical equipment in an aircraft environment;
- (m) Helicopter emplaning and deplaning procedures;
- (n) General aircraft safety rules (references: *Helicopter Passenger*, Transport Canada (TP 4363E) and *A Safety Guide for Aircraft Charter Passengers*, Transport Canada (TP 7087E); and
- (o) In-flight patient care (reference: Health Canada, Medical Services Branch, *Patient Care in Flight, Manual for Medical Services Personnel*).

Dispatchers and Coordinators – Air ambulances are usually controlled by a formalized system which encompasses tasking, priorities, communications, operational control, etc. One of the keys to the effectiveness of these systems is the dispatcher or coordinator, used in this context as the air ambulance dispatcher, not the air operator’s operations officer, although these positions may be combined. Often, however, air ambulance dispatchers are part of the land ambulance system and may not be knowledgeable about the aviation aspects of the service. Compounding this problem, many air ambulance flights are self-dispatched, particularly those of an urgent nature, thus the additional assistance that a pilot might receive from the flight operations manager may not be available. It is, then, imperative that the decision-making process leading to the dispatch of an air ambulance be clearly defined and understood by all involved. To this end, dispatchers should receive training in the following:

- (a) Weather reporting system;
- (b) Weather limits for applicable aircraft types;
- (c) Aircraft performance and capabilities;
- (d) *Canadian Aviation Regulations* as applicable; and
- (e) Air operator tasking procedures.

8.0 MEDICAL CONSIDERATIONS

The first step leading to the assigning of an air ambulance is the decision by the medical authority, usually a physician or nurse, to move the patient by air. The changes associated with flying, however, may constitute an additional hazard for some patients. It is important that medical personnel are aware of the effect of the aviation environment on various conditions and make their decision based on an established set of criteria. Health Canada has produced a manual “*Patient Care in Flight*” for the guidance of its Medical Services Personnel and this publication, or a similar one, should be available to those charged with initiating air ambulance service requests.

9.0 HELICOPTOR OPERATIONS

Helicopter air ambulance operations conducted between airports or certified heliports are essentially no different from aeroplane operations. Operations from austere or unprepared sites, however, do require special consideration and, although not common in Canada, some ambulance services may wish to be prepared for such an eventuality in the event of an emergency. Operations from such sites, particularly at night, require careful planning and a number of factors should be considered. United States Federal Aviation Administration Advisory Circular 135-14 entitled “Emergency Medical Services/Helicopter (EMS/H)” provides a useful summary of these factors, some of which are outlined below:

- (a) A moveable search light capable of operation without the pilot having to remove his hands from the controls;
- (b) Air to ground communications with persons on the landing site;
- (c) Restraining devices for preventing patients from interfering with the flight controls (patients are less likely to be stabilized prior to transfer);
- (d) An intercommunications system between flight crew and medical personnel
- (e) A wire strike protection system;
- (f) Weather minima;
- (g) Landing site evaluation procedures;
- (h) Training of personnel in loading and unloading the helicopter with rotors turning; and
- (i) Training of at-the-scene ground personnel (involves police, ambulance attendants etc. in landing site selection and marking; weather estimation, hazards to landing, loading, etc.).

10.0 SAFETY MANAGEMENT

TC encourages all air operators to establish a company aviation safety management program. This program involves a commitment to safety from all company personnel, from the Chief Executive Officer down to the newest apprentice. The key to its success is the Company Safety Officer, who is the coordinator of the program and is responsible for its implementation. Information on this program is available from the TC Regional Aviation Safety Officers (RASO's) or in the pamphlet “Safety Business” (TP 10008).

A successful company safety management program can have a positive effect on many aspects of air ambulance operations and one of the most important is pilot judgment. Training in Pilot Decision Making (PDM) and Cockpit Resource Management (CRM) are developments in the aviation industry and are particularly applicable to the often life and death nature of the air ambulance mission.

It is recommended that all air ambulance operators have in place a viable Aviation Safety Management Program.

11.0 AIRWORTHINESS

All medical equipment carried on board aircraft being operated as air ambulances is subject to TC airworthiness approval. The following guidelines have been developed to assist operators:

Carriage of Incubators and Stretchers

(For temporary installation on aircraft for med-evac purposes.)

This guide for carriage of stretchers and incubators has been written to facilitate their use on large aircraft carrying flight attendants, small aircraft without flight attendants and helicopters without flight attendants. Also taken into consideration was the fact that some flights may be operating solely on a med-evac mission, while others may be operating on regular scheduled services.

Stretcher or Incubator Installation

The stretcher or incubator installation:

- (a) Shall not interfere with any operation of any aircraft controls;
- (b) Shall not restrict access to, or the use of, regular exits;
- (c) Shall not obstruct any emergency exit, or the aisle(s) leading to an emergency exit;
- (d) Shall not restrict access to emergency equipment; and
- (e) Should be so arranged as to allow ready access by accompanying medical personnel to perform monitoring and therapy functions when needed.

Restraint Systems

All stretcher and incubator restraint systems require Transport Canada (Airworthiness) approval. Each restraint system, including anchorage to the primary aircraft structure, shall be designed for an average occupant weight of 170 pounds and for the maximum load factors corresponding to the specified flight and ground load conditions, including the emergency landing conditions prescribed in the applicable sections of the Airworthiness Manual. (Refer to Section 561, 785, 789 and 1413 of Chapter 523, 525, 527 and 529, as applicable). A safety factor of 1.33 shall be applied to the ultimate inertia forces stated in Section 561.

Application for approvals shall be directed to the Regional Division, Airworthiness.

The attachment of the stretcher or incubator to the aircraft structure shall allow its rapid detachment for evacuation.

Patient Restraint

The patient restraint shall be designed to prevent unwanted movements of the person using it during turbulence or in an emergency landing, and to apply the restraining loads over a large area of the body.

All patient restraint systems require TC (Airworthiness) approval. Each patient restraint system, including anchorage to the primary aircraft structure, shall be designed for an average occupant weight of 170 pounds and shall protect the patient when subjected to the maximum loads corresponding to the specified flight and ground load conditions, including the emergency landing conditions prescribed in the applicable sections of the Airworthiness Manual. (Refer to Section 561, 785, 789 and 1413 of Chapter 523, 525, 527 and 529, as applicable. A safety factor of 1.33 shall be applied to the ultimate inertia forces stated in Section 561.)

Application for approvals shall be directed to the regional division of Airworthiness.

Each patient restraint system shall have a quick-release means to allow its rapid detachment in an evacuation.

Some patients may be so injured that the restraint system used will be based on a medical opinion. Medical evacuations, as a rule, involve stabilized patients. An emergency situation involving a patient who is unable to be restrained on a stretcher prior to being stabilized is very rare. However, should this occur, the patient should be transported on a flight whose sole purpose is the medical evacuation.

All medical equipment shall be appropriately restrained in a manner acceptable to TC.

Patient Orientation

The preferred orientation is the patient's head towards the front of the aircraft so that most of the forward loads applied by the patient restraint system are applied on the shoulder area. In an aeroplane, the patient should be placed fore and aft along the longitudinal axis. This is the preferred orientation for helicopters, as well; however, due to the different structural configuration and possible crash scenarios, this may not be feasible if warranted.

Medical Attendant

While not specifically required by regulation, all patients, particularly those confined to a stretcher or babies in incubators, should be accompanied by a medical attendant. Attendants should be assigned a seat which is convenient to their patient.

Incubator oxygen supply and restraint

An incubator may feature a self-contained oxygen supply capable of delivering a controllable flow rate.

An adequate supply of oxygen normally will be provided by the medical authorities. The aircraft oxygen system shall not be used.

If extra oxygen cylinders are to be carried, they shall have protective containers and be capable of being appropriately restrained in a manner acceptable to TC.

12.0 SUMMARY OF REFERENCES

- (a) Part VII, Canadian Aviation Regulations – TC;
- (b) *Airworthiness Manual* – TC;
- (c) *Patient Care in Flight, Manual for Medical Services Personnel* – Health Canada
- (d) *Helicopter Passenger* (TP 4263) – TC;
- (e) *Safety Business* (TP 10008) – TC;
- (f) *A Safety Guide for Aircraft Charter Passengers* (TP 7087) – TC; and
- (g) U.S. Federal Aviation Administration, Advisory Circular 135-14 “Emergency Medical Services/Helicopter”.