Air Ambulances - Research Briefing
November 2009

Overview of Research Briefing

This research briefing provides an overview of Air Ambulance Services in the UK and some examples from across the world, with sections on England, Scotland, Wales, Northern Ireland and the Republic of Ireland, Norway, Austria, Canada, New Zealand, and Australia. Several important issues for consideration are discussed in more detail including tasking of air ambulances, safety, the potential need for supplementary rapid response vehicles, and the need to plan for the effects of air ambulance admissions on receiving hospitals. The briefing ends with a section of concluding comments highlighting findings from the 2007 Report *Trauma: Who Cares?*[1] and noting several barriers, identified in the literature, which may prevent a greater role for air ambulances in the UK.

Contents

1. Introduction to Air Ambulances Services in the UK

There are currently 27 Air Ambulance organisations in the UK operating from 34 locations[2]. Aircraft with two paramedics on board are still the most usual set-up. The principle of a doctor-paramedic team was first used by the London Helicopter Emergency Service (HEMS) in 1988. In total, the Air Ambulance Services of the UK[3] undertake over 19,000 missions per year and serve 177 accident and emergency departments. The missions are made up of 40% road traffic collisions, 24% other medical emergencies and 3% hospital transfers. Air Ambulance Charities in the UK collectively generate an annual income of around £46 million or £125,000 raised every day. On average a mission costs £1,229 and the average spend per helicopter is £843,000 per year. The Air Ambulance Charities spend £15m per year in the helicopter industry.

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[1] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007

[2] www.aeroflight.co.uk/waf/uk/ems/uk-ems-home.htm

[3] Amazing Facts about your Air Ambulance, Association of Air Ambulances in the UK, www.airambulanceassociation.co.uk/amazing_facts.php

In 2007 the Air Ambulance Working Group (AAWG) was set up with experts in the sector to consider future air ambulance practice and procedure. The AAWG note that "*correctly used HEMS operations target the most seriously ill or injured patients and those likely to benefit most from early medical input regarding; scene management, triage, treatment and transfer. Other benefits can be recognised in providing rapid, controlled and skilled secondary transfers to tertiary centres for further specialist input after initial resuscitation in a non-specialist hospital*"[4].

The air ambulance sector distinguishes between a Helicopter Emergency Medical Services (HEMS) flights and air ambulance missions. A HEMS flight is a mission governed solely by medical need and carried out by a helicopter operating under a HEMS approval. It aims to facilitate emergency medical assistance where immediate and rapid transportation is essential, by carrying medical personnel, and/or medical supplies, and/or ill or injured persons and other persons directly involved[5].

An air ambulance mission, by contrast, is usually planned in advance and is one where the aircraft is used as an extension of the ambulance service land vehicles for the transport of patients to and from hospital or from land vehicles to hospital. For example, such a mission can provide for the subsequent transfer of patients delivered initially to a local emergency department by a road crew in order to expedite their care to a specialist unit such as burns, spinal or paediatric intensive care[6].

The two main staffing models used on HEMS operations are[7]:

- The Paramedic–Paramedic model used on over 80% of aircraft. State paramedics operate within the standards set by the Joint Royal Colleges Ambulance Service Liaison Committee whether they operate in road or air ambulances. It is considered internationally that such a model is the best if supported by strong medical oversight and direction via remote telemedicine (such as used in Ontario);
- The Paramedic-Physician model provides a higher level of clinical expertise for patients and correctly used these HEMS operations provide early advanced medical input normally delivered in a hospital setting. This is the model of care used throughout Europe, Scandinavia, and Australasia.

2. Air Ambulances in the UK and Republic of Ireland

2.1 England

The first civil helicopter-based air ambulance in the UK was opened in Cornwall in 1987. The distance to the major hospitals from many parts of Cornwall means that the air ambulance has become a lifesaving mode of transport. In 1988 a report by the Royal College of surgeons recommended "*setting up a network of trauma centres geared specifically to dealing with the types of injuries sustained in major accidents, to which patients would be flown by a national fleet of EMS [emergency medical*

[4] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 1.3, page 6
[5] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 2.2.3, page 13
[6] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 2.2.3, page 13
[7] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 2.2.4, page 14

service] helicopters"[8]. The recommendation for the trauma centres has not yet been realised, however many counties and authorities have set up their own air ambulance programmes.

In England 17 air ambulances services were in operation at 1st July 2008[9]. The majority of these air ambulance services are independent charities with the remainder being NHS Corporate Trustees or independent charities with NHS representation on their Boards. The NHS usually meets the cost of ambulance personnel who work on the air ambulance. The two main funding models reflect the relationship between the funding charity and the Ambulance Services[10]:

- Several charities are established as 'Owner/Operator' Charities. These provide the air ambulance Service and support the NHS Ambulance Services;
- 'Grant-Giving' Charities are essentially those that provide the funding for the service but the operational and clinical management are the responsibility of the NHS Ambulance Service.

In both models there is a 'Memorandum of Understanding' between the Charity and the participating NHS Ambulance Service(s) defining the roles and responsibilities of all members of the parties and the reporting and communication arrangements[11] .

In addition to the Association of Air Ambulances (the representative body for the Air Ambulance Services in the UK), in 2006 the Association of Air Ambulance Charities was launched to support and co-ordinate the charitable trusts that fund Air Ambulance Services in the UK[12].

One of the current issues facing many air ambulance services in England is surges in demand for the services which puts a strain on the finances of the particular charities involved. For example, the Great North Air Ambulance Service was called out 154 times in April 2009 compared to 75 times in April 2008. The Charity involved believes that this is due to improved relationships with the North-East Ambulance Service (NEAS) as the "*helicopters are quite often activated by NEAS if a 999 call sounds serious enough to warrant air support*"[13].

The potential for night flying is another pressing problem as under Civil Aviation Authority rules helicopters require specialised equipment to fly at night and such equipment is too expensive for most air ambulance charities. Wiltshire has got around this problem by having a shared police and air ambulance helicopter, which is only one of two in England to be shared in this way but means that it can fly at night.

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[8] Air Ambulances, House of Commons Hansard, Westminster Hall Adjournment Debate, 27th Feb. 2008

[9] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, page 10 - Cornwall Air Ambulance; County Air Ambulance (Shropshire); Devon Air Ambulance Trust; Dorset and Somerset Air Ambulance; East Anglian Air Ambulance; Essex and Herts Air Ambulance Trust; Great North Air Ambulance Service; Great Western Air Ambulance; Hampshire and Isle of Wight Air Ambulance; Kent Air Ambulance; Surrey/Sussex Air Ambulance; Lincolnshire and Nottinghamshire Air Ambulance, London's Air Ambulance; North West Air Ambulance; Thames Valley and Chiltern Air Ambulance; Warwickshire and Northamptonshire Air Ambulance; Derbyshire, Leicestershire and Rutland Air Ambulance; Wiltshire Air Ambulance; and Yorkshire Air Ambulance.

[10] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 2.2.1 and 2.2.2, pages 7-8

[11] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 2.2.2, page 9

[12] www.aeroflight.co.uk/waf/uk/ems/uk-ems-home.htm

[13] Popular air ambulance in plea for funding, Daily Star, May 22, 2009

It has been held up as a model of service that should be considered throughout the country[14].

2.2 Wales

The Wales Air Ambulance Service has three helicopters based in the North (Caernarfon), Mid Wales (Welshpool) and the South (Swansea). Each crew has one pilot and two advanced life support paramedics. Each helicopter can be launched within three minutes of receiving the emergency call and can be anywhere in Wales within 20 minutes. A 999 call in Wales for an ambulance goes to Ambulance control who make the decision whether to deploy one of the helicopters[15].

The Welsh Air Ambulance Charitable Trust was established to raise funds for the Wales Air Ambulances and works in partnership with the Welsh Ambulance Services NHS Trust[16]. The Charity needs to raise over £5 million per year to operate the service and each mission costs on average £1200. The Charity receives no direct funding from the government. The money is raised, as with all ambulance charities, through charitable donations, fundraising events and membership of their lifesaving lottery[17].

2.3 Scotland

Unlike the rest of the UK, in Scotland the Air Ambulance Service is fully funded by NHS Scotland and operates as part of the Scottish Ambulance Service. The service provides a "*vital lifeline to the people of Scotland, especially those in remote, rural and island communities*"[18]. The Board of the Scottish Ambulance Service (SAS) awarded the contract for a new Air Ambulance Service for Scotland to Gama Aviation in April 2006. The contract will run for seven years and is valued at approximately £40 million. Gama Aviation operates two EC 135 Eurocopter helicopters from Glasgow and Inverness and two new purpose built fixed wing King Air 200c aircraft from Aberdeen and Glasgow. These are further supported by a medically fitted Super Puma Search and Rescue helicopter based in Shetland[19].

The two helicopters based in Glasgow and Inverness respond to emergency calls and to requests from remote, rural or island clinicians to transport patients to mainland health care facilities. The two planes based in Aberdeen and Glasgow mainly respond to medical requests to transfer patients between hospitals. The Scottish Ambulance Service also has access to Search and Rescue aircraft of the Ministry of Defence and HM Coastguard for support when its own aircraft are unable to fly[20]. For example, for the period 1 January 2008 to 31 August 2008 there were four occasions when the Ministry of Defence or the Coastguard were used in lieu of the Air Ambulance, twice due to weather conditions and twice because no SAS aircraft were available at the time of the 999 call[21]. Other work that is underway within the SAS is a trial of the Emergency Medical Retrieval Service. The service will fly out specialist consultants to provide on-site resuscitation and safe transfer for patients with life threatening injuries or illness in remote and rural hospitals. Consultants will also provide 24/7 online and telephone advice to any healthcare

[14] Air ambulance praised by minister, Salisbury Journal, June 9, 2008
[15] Introduction to Wales Air Ambulance, www.walesairambulance.com
[16] Wales Air Ambulance, www.ambulance.wales.nhs.uk/Default.aspx?pageId=57&lan=en
[17] Introduction to Wales Air Ambulance, www.walesairambulance.com
[18] www.scottishambulance.com/AirAmbulance/Default.aspx
[19] Board Approves Recommendations for New Air Ambulance Service, http://www.scottishambulanceservice.co.uk/air_ambulance.htm
[20] www.scottishambulance.com/AirAmbulance/Default.aspx
[21] The Scottish Parliament, Response to written question S3W-15924, lodged Sept. 02, 2008

professional within the trial area regarding any critically ill or injure patient and their potential transfer or retrieval[22].

2.4 Northern Ireland and Republic of Ireland

There is no air ambulance service currently operating in Northern Ireland. The Northern Ireland Ambulance Service (NIAS) presently defines use of air ambulance service as a planned inter-hospital transfer service of patients by air. This is occasionally carried out using the services of private companies and the Royal Air Force (RAF). The following table shows the number of patients transported by air by HSS Boards in the years 2001-02 to 2005-6[23].

Number of Patients	NHSSB	SHSSB	EHSSB	WHSSB
2001-02	11	20	14	14
2002-03	13	10	23	7
2003-04	13	5	19	17
2004-05	13	18	18	12
2005-06	17	15	25	7
Total	67	68	99	57

The following table shows the number of such air ambulance journeys made since 2005/06, however is not directly comparable with the table above as the figures have since been collated as number of journeys rather than number of patients[24]:

Number of Journeys	Northern Board	Southern Board	Eastern Board	Western Board
01/04/06-31/03/07	11	29	39	32
01/04/07-31/03/08	28	33	58	19
01/04/08-31/03/09	40	21	77	18
01/04/09-30/09/09	11	7	41	6
Total	90	90	215	75

The majority of the air ambulance journeys in the above tables relate to inter-hospital referrals for treatment of liver and heart conditions to Kings College, Freeman, Great Ormond Street Hospital and Birmingham Children's Hospital. The figures also include a small number of repatriations[25].

On occasions when it is necessary to evacuate a casualty from a scene using a helicopter, the NIAS engages the Maritime Coastguard Agency. In 2004 there were 21 such casualties, in 2005 there were 18 and in 2006 there were 8[26]. NIAS has confirmed that it has not engaged or tasked the Maritime and Coastguard Agency to evacuate casualties by helicopter from 2006 to date[27].

[22] Delivering for Remote and Rural Healthcare: What it means for you, The Scottish Government, www.scotland.gov.uk/Publications/2008/05/07093541/8
[23] Table taken from response to House of Commons Written Question, Air Ambulance, 16 March 2006
[24] Personal Communication from Daniel Kelly, DHSSPS, 28/10/2009
[25] Personal Communication from Daniel Kelly, DHSSPS, 3/11/2009
[26] Information taken from response to House of Commons Written Question, Air Ambulance, 16 March 2006
[27] Personal Communication from Daniel Kelly, DHSSPS, 28/10/2009

In the Republic of Ireland, air ambulance services are provided as civil community support by the Air Corps of The Defence Forces. A formal agreement signed with the Department of Health and Children in November 2007 covers the emergency transfer of patients between hospitals in the Republic of Ireland and the UK. The Air Corps is on standby 24 hours a day and over the period 1st January 2009 to 19th August 2009 had completed 133 flying hours on medical cases including eight neo-natal cases, 11 organ retrievals and 25 inter-hospital transfers. The Government learjet had been used six times, the maritime patrol Casa plane in nine cases and the AW139 helicopter 24 times[28].

A *Feasibility Study on a Helicopter Emergency Service (HEMS) for the island of Ireland* was published by the DHSSPS and the Republic of Ireland's Department of Health and Children in April 2004. The Report identified three possible response roles for a HEMS[29]:

- Primary Response – transport of medical personnel and equipment direct to the scene of an incident and the rapid transport of patient(s) to hospital;
- Secondary Response – direct to a designated site to meet road ambulance(s) coming either from a hospital or incident site to facilitate rapid on-carriage of patients by helicopter to hospital; and
- Tertiary Response – planned urgent and rapid transfers of critically ill patients requiring specialist care between hospitals.

The Study concluded that a feasible role for a dedicated HEMS in "*an all-Ireland context*" appeared to be the tertiary response role and to support that role,

> "*significant investment would need to be made into, inter alia, supporting assets (e.g. helipads, communications systems) and other systems (e.g. skills training, operational and management arrangements, pre-hospital emergency care and related systems integration) in order for dedicated HEMS in the inter-hospital role to be effective… the case for HEMS in the 'primary response' role, in particular (and to a lesser extent, in the 'secondary response' role) is significantly less obvious, particularly in terms of cost-effectiveness and in terms of the potential that may exist to divert funds from existing plans and initiatives associated with development of ground ambulance services and other elements of critical care transport*"[30].

The Minister for Health, Social Services and Public Services appears to currently have no plans for an air ambulance and has maintained his stated priority to invest in modernising ground ambulance services to enable the NIAS to improve its response to emergency calls. Investment of nearly £100 million over the next 10 years is being provided to enable the NIAS to modernise its fleet and equipment on a regular basis[31].

In spite of these stated priorities for the NIAS, Ireland Air Ambulance, a registered charity, was established in 2007 with the aim of providing the region's First Helicopter

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[28] Government jet doubles as air ambulance six times in year, Irish News, August 19, 2009

[29] Feasibility Study on a Helicopter Emergency Medical Service (HEMS) for the Island of Ireland, Final Report, Booz, Allen and Hamilton for DHSSPD and Department of Health and Children, December 2003, www.dhsspsni.gov.uk/hems_contents.pdf, Executive Summary, Key Findings

[30] Feasibility Study on a Helicopter Emergency Medical Service (HEMS) for the Island of Ireland, Final Report, Booz, Allen and Hamilton for DHSSPD and Department of Health and Children, December 2003, www.dhsspsni.gov.uk/hems_contents.pdf, Executive Summary page vi

[31] Information taken from Response to Assembly Question AQO 2657/09, tabled 24/04/09

Emergency Medical Service (Alpha 5). It is proposed to be only the second in the UK to have a doctor on board full time and is proposed to operate 365 days a year. The operating range of the service is proposed as "*Antrim, Armagh, Belfast, Cavan, Donegal, Down, Dublin, Fermanagh, Galway, L'derry, Leitrim, Louth, Longford, Mayo, Meath, Monaghan, Roscommon, Sligo, Tyrone, Westmeath, Rathlin Island and the Isle of Man*" [32]. It will be funded by charitable donations and Corporate Funding with funding for the medical staff sought from the DHSSPS budget. Since 2007 Ireland Air Ambulance has raised £700,000 but has recently attracted controversy when it was revealed that in the first year it had spent nearly 90% of its funds on set-up costs[33].

As has been discussed above for other regions of the UK, such air ambulance services require close working relations with the local ground ambulance service and in June 2009 the Health Minister stated that "*my officials have met representatives from Alpha 5 on a number of occasions however it has not been possible to agree any protocols for their participation in emergency services in Northern Ireland*"[34].

In September 2009, the Committee for Health, Social Services and Public Safety was approached by another charity, West Coast Ambulance Services, requesting to meet with the Committee to present its case in taking the lead on a new air ambulance provision for Northern Ireland.

In February 2009, plans for a "*dedicated all-Ireland air ambulance service*" were launched in Cork. Organisers say that the charity-funded project aims to raise EUR85,000 a month to run the service, which is based on the model of the community-funded system operating in Cornwall[35].

3. Examples of Air Ambulance Services Across the World

3.1 Canada - Ontario

In 1977, Ontario was the first Canadian province to provide a helicopter-based air ambulance. The air ambulance program is now an integrated part of the larger emergency health system. In July 2005, the government announced the appointment of Ornge (formerly the Ontario Air Ambulance Services Co.) to co-ordinate all aspects of Ontario's air ambulance system, including the contracting of flight service providers, medical oversight of all air paramedics, air dispatch, and authorising air and land ambulance transfers. Ornge is a non-profit body accountable to the Ontario government through a performance agreement[36].

Ornge operates from numerous bases across Ontario and nine of these bases are staffed 24 hours a day, seven days a week. It has 300 employees including paramedics, paediatric transport nurses, transport medicine physicians, lead educators, researchers and office staff. Ornge is not accessible to the public through the 911 emergency number but the dispatch of its services are the responsibility of the Ornge Communications Centre as defined by the Ontario Ambulance Act. An Ornge helicopter responds to an accident scene or to a remote area when requested by the local land ambulance Central Ambulance

[32] www.irelandairambulance.org/saving.aspx
[33] Air Ambulance Charity spent 90% of donations on set-up costs, Michael McHugh, Press Association June 15 2009
[34] Air Ambulance will save lives says Deeny, The Press Association, June 22, 2009
[35] Air Ambulance plans launched, RTE News, February 16, 2009
[36] Ontario Air Ambulance Program, www.health.gov.ca/english/public/program/ehs/air/air_mn.html

Communications Centres/Ambulance Communications Services[37]. Ornge has created an Academy of Transport Medicine which offers the only Canadian Medical Association accredited Critical Care Flight Paramedic Program in Canada[38].

3.2 New Zealand

The use of aircraft to deliver emergency ambulance services in New Zealand is built on the development over the last three decades of community-based rescue helicopter services, which also assist in search and rescue missions and other non-medical emergency situations. Subsequently there is a high-level of community 'ownership' with community donors and corporate and grant funders being key stakeholders.

There are ten Charitable Trusts and ten Private Operators operating emergency helicopters and/or fixed-wing aircraft to deliver ambulance services throughout New Zealand, including a total of 41 helicopters (18 are dedicated emergency helicopters) and 13 fixed-wing aircraft[39]. Based on a recent 12 month sample, the annualised mission total is on average 8,095 of which 32% are primary missions, 51% are secondary inter-hospital transfer missions, 5% are other emergency missions, and 125 are other missions[40].

The bulk of revenue for the emergency helicopters comes from donations, grants and sponsorships (59%), followed by several main streams of government funding, including the Accident Compensation Corporation (ACC), (34%). Other government, commercial, and 'other' account for the remaining 7%. By comparison the bulk of revenue for fixed wing aircraft is from District Heath Boards for inter-hospital transfers (82%), followed by the ACC (10%) for inter-hospital transfers made within 24 hours[41].

The Air Ambulance Reference Group (AARG) project was established to provide expert advice to the Minister for ACC and the Minister of Health on a framework for the provision of air ambulance services for New Zealand[42]. The focus of the report was on primary emergency retrieval missions. The key issues identified were as follows[43]:

- The need for consistency of standards and service specifications;
- The need for national oversight, planning and advice on diverse local and strategic interests;
- The requirement for medium and long-term funding and contracting to manage costs and ensure sustainability; and
- Data collection and analysis to inform future policy and investment decisions.

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[37] Introduction to Ornge, www.ornge.ca
[38] www.ornge.ca
[39] Report of the Air Ambulance Reference Group to the Accident Compensation Corporation (ACC) and Health Ministers, 28 February 2008, page 22, http://www.moh.govt.nz/moh.nsf/indexmh/report-air-ambulance-reference-group
[40] Report of the Air Ambulance Reference Group to the Accident Compensation Corporation (ACC) and Health Ministers, 28 February 2008, page 24, http://www.moh.govt.nz/moh.nsf/indexmh/report-air-ambulance-reference-group
[41] Report of the Air Ambulance Reference Group to the Accident Compensation Corporation (ACC) and Health Ministers, 28 February 2008, page 28, http://www.moh.govt.nz/moh.nsf/indexmh/report-air-ambulance-reference-group
[42] Report of the Air Ambulance Reference Group to the Accident Compensation Corporation (ACC) and Health Ministers, 28 February 2008, http://www.moh.govt.nz/moh.nsf/indexmh/report-air-ambulance-reference-group
[43] Report of the Air Ambulance Reference Group to the Accident Compensation Corporation (ACC) and Health Ministers, 28 February 2008, page 11 http://www.moh.govt.nz/moh.nsf/indexmh/report-air-ambulance-reference-group

3.3 Australia

The Royal Flying Doctor Service (RFDS) of Australia is "*is the largest and most comprehensive aeromedical organisation in the world*". Its is a not-for-profit charitable service providing both aeromedical emergency and primary health care services together with communication and education assistance to people who live, work and travel in regional and remote Australia. There are six RFDS Sections that provide the service and fund raise for the RFDS nationally to top up the government funding received. These Sections are Central Operations, Queensland Section, South Eastern Section, Tasmanian Section, Victorian Section, and Western Operations[44]. Together the six Sections form the Australian Council of the RFDS. National matters for the RFDS are governed by the National Board of Directors. The National Office is situated in Sydney and manages and distributes Commonwealth Government funds to RFDS Sections and coordinates national strategies on health, aviation, communications, public affairs, fundraising, legal and industrial matters[45].

Aero-medical retrievals and inter-facility transports are conducted from RFDS Bases and RFDS retrieval staff are available to respond to calls 24 hours a day, seven days a week. The service includes the provision of primary responses and the transport of patients between health facilities. The medical staffing of retrievals and transports differs depending on the patient's clinical condition with some being attended by both a medical officer and flight nurse while others will be attended by a flight nurse only. Coordinating medical staff work full-time in the air medical retrieval role, have a well-developed understanding of the geography of the state and the resources of referring and receiving centres[46].

The following table, directly extracted from the Flying Doctor website[47] illustrates the range of services provided:

For the year ended 30 June 2007 Service Area km2 - 7,150,000	**Daily Average**	**Year**
Patients attended	665	242,547
Aeromedical Evacuations	96	35,089 {1)
Healthcare Clinics	34	12,247
Distance Flown (kms)	59,492	21,714,595
Number of Landings	178	65,074
Telehealth	207	75,439
Number of Aircraft	-	47
RFDS Bases	-	21 {2)
RFDS Health Facilities	-	6 {3)
RFDS Other Facilities	-	4 {4)
Staff		705 {5)

[44] www.flyingdoctor.net/Where-We -Are.html
[45] www.flyingdoctor.net
[46] http://www.flyingdoctor.net/Aeromedical-Retrievals-and-Inter-facility-Transports.html
[47] http://www.flyingdoctor.net/What-We-Do.html

{1) Includes hospital tranfers
{2) RFDS Base is a health facility that houses an aircraft and provides health services
{3) RFDS Health Facility is a health facilty that does not have an aircraft but provides health services
{4) RFDS Other Facilities include marketing, fundraising and public relations as well as the National Office
{5) Includes 155 part-time and casual staff

3.5 Europe

3.5.1. European Air Ambulance

European Air Ambulance is a worldwide Air Ambulance provider based in Karlsruhe/Baden-Baden in Germany, where it has a multi-lingual Mission Control Centre (MCC). The founding members of European Air Ambulance are DRF Luftrettung and LAR(Ducair) with a combined record of 40 years of medical repatriation from over 150 countries, 24 hours per day, 365 days a year. The MCC coordinates a fleet of six Air Ambulance aircraft based in Luxembourg and Karlsruhe/Baden-Baden. All missions are staffed by an intensive car medical tem consisting of one physician and one flight nurse/paramedic[48].

3.5.2 Norway – The Norwegian Air Ambulance Group

The Norwegian Air Ambulance Foundation was established in 1977 with the aim of improving the quality of the emergency medical service. In 1988 the Norwegian government assumed responsibility for the running of the air ambulance programme and since then the Norwegian Air Ambulance Group has received most of its funding from the government. The Norwegian Air Ambulance Group presently consists of the Norwegian Air Ambulance Foundation and the subsidiaries Norwegian Air Ambulance AS, NLA Global Medical support AS and SOS Flygambulans AB[49]:

- The Norwegian Air Ambulance Foundation – with 800,000 members (20% of Norwegian population). The foundation funds and implements activities that strengthen the entire chain of emergency medical care, for example public campaigns, and training programmes;
- Norwegian Air Ambulance AS – This subsidiary runs the majority of the Norwegian air ambulance helicopter service, on assignment from the Norwegian health enterprises' air ambulance services. The crew of each helicopter consists of a pilot, a HEMS crew member and an anaesthetist with considerable emergency medical care experience.
- NLA Global Medical Support AS – This subsidiary operates an international response centre which coordinates and provided medical assistance worldwide offering the benefits of the membership of the Air Ambulance Foundation on an international basis to assist members in case of illness or injury abroad; and
- SOS Flygambulans – This subsidiary handles the repatriation of members of the Norwegian Air Ambulance Foundation in the event of illness or injury abroad and also carries out fixed wing air ambulance transport in Sweden on behalf of the counties in Southern and central Sweden and in addition to air ambulance assignments in Northern Europe on behalf of insurance companies and other corporations.

[48] www.air-ambulance.com
[49] http://www.norskluftambulanse.no/About_Norwegian_Air_Ambulance_FEjIZ.pdf.file

3.5.3 Austria - Tyrol Air Ambulance

Tyrol Air Ambulance officially started in 1976 in Innsbruck. Today the company has five ambulance jets and airliners. In 1990 Tyrol Air Ambulance started the world's first scheduled air ambulance service operating 'plaster shuttles' several times a week every winter. These planes flying between Innsbruck, The French Alps, The Netherlands, Belgium and England are reserved for victims of ski accident. All equipment for Tyrol Air Ambulances, and for all Austrian rescue helicopters, is provided by another company of the group, Air Ambulance Technology which exports aeromedical equipment worldwide[50].

4. Other Issues for Consideration

4.1 Tasking Criteria

The Air Ambulance Working Group (AAWG) describe 'tasking' of the aircraft as one of the main determinants of the success of a HEMS operation, "*HEMS success is dependent on finding the right cases, arriving in a timely manner and delivering advanced interventions to the patients before transporting them to the most appropriate hospital. Any break in that chain will result in a failure of tasking with potentially serious implications for both the patient and the HEMS organisation*"[51].

The AAWG estimate that inappropriate tasking currently costs the Air Ambulance Charities approximately £6million per annum and that around 56% of all HEMS activations result in non-carriage for various reasons including stand-downs, patients treated at scene, fatalities, and the distance between incident scene and the nearest appropriate hospital[52].

Littlewood *et. al.* compared the tasking criteria, dispatch arrangements and crew configuration for all helicopter ambulance services in the UK and discovered that there were 67 different tasking criteria used for air ambulance dispatch in the UK with a range from 4 criteria to 23 criteria for individual air ambulance services[53].

The AAWG note that there are no definitive guidelines for call selection and HEMS tasking, however it highlighted some basic principles as follows[54]:

- The purpose of aero medical emergency transfer is to provide better initial patient care and transport than available alternatives;
- Air response is only justified where the speed of transport, skill of the medical team and/or availability of the helicopter to overcome environmental obstacles contribute to improved patient outcome;
- In trauma, helicopter deployment is not justified if it does not significantly reduce the time between injury and the patient arriving at an appropriate hospital unless the response delivers additional medical expertise or equipment to the scene.

With regard to tasking, the AAWG note that "*deployment under HEMS/Air Ambulance is governed solely by the medical need of the patient*", therefore[55]:

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[50] www.taa.at
[51] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 6.1.1, page 31
[52] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 6.1.1, page 31
[53] Littlewood, N. et. al (2009), The UK helicopter ambulance tasking study, J. Injury, **4** (2), Science Direct - online 12 June 2009
[54] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 6.1.1, page 32

- There should be clear tasking criteria;
- The potential medical need should be ascertained prior to a HEMS tasking;
- All persons connected with the decision-making process in tasking an Air Ambulance should have a working knowledge in the difference between Air Ambulance and HEMS classifications;
- Regular and transparent monitoring of tasking should be undertaken by the tasking authority, in conjunction with the Air Ambulance operation, to ensure the correct practice in tasking under HEMS/Air Ambulance.

To ensure a consistent standard of tasking, dispatch protocols should be established and best practice indicates that these should include[56]:

- Medical/trauma criteria for considering dispatch;
- Minimum level of information available before a dispatch can be effected;
- Geographical limitations;
- Access to incident;
- Patient conditions that are not suitable for Air Ambulance conveyance;
- Medical skill of aircrew to meet patient need;
- Availability of other suitable medical resources;
- Treatment centre locations/distance/speciality services; and
- Who is able to stand down an Air Ambulance once deployed (i.e. medical personnel only or other personnel also).

4.2 Safety

The safety of air ambulances is not reported to be a concern for the UK; however, the issue has been raised, particularly in relation to the United States (US). A study by the National Transportation Safety Board (NTSB) of the US revealed that in a three year period ending in early 2005, air ambulance crashes had killed 54 people in the US, most of them pilots[57]. The accident statistics for the US were in stark contrast to those for Canada which, to the same date, had not had a fatality since 1977, "*unlike most companies in the United States, Canada requires two pilots on each helicopter, and flights are conducted under more rigorous standards for weather*"[58].

The lessons learnt from the NTSB study, although specific to how the industry operates in the US, are potentially pertinent to air ambulance safety in general. The industry in the US has seen substantial growth in recent years and is now the only way that 28% of the nation's population can reach a top trauma centre in 60 minutes. In addition, this growth has meant that more helicopters are based in rural areas and must make a profit to be viable there. Such operators use less expensive helicopters lacking some of the more sophisticated safety features than hospital-based helicopters[59]. The recommendations sent by the NTSB to the Federal Aviation Administration in the US were intended to improve the safety of all air medical services and included[60]:

- Requiring emergency medical services operators to install terrain awareness and warning systems on their aircraft; and

[55] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 6.1.3, page 33
[56] Framework for a High Performing Air Ambulance Service, Air Ambulance Working Group, August 2008, Section 6.1.3, page 34
[57] Report Faults Rules and Judgement in Air Ambulance Accidents, The New York Times, January 26th 2006
[58] Air-Ambulance Crews in Risky Jobs, USA Today, February 4th 2009
[59] Safety Rules Can't keep Pace, USA Today, 19th July, 2005
[60] Zigmond, J (2009), *Modern Healthcare*, Emphasis on Training, 39 (6), 16

- Development and implementation of flight-risk evaluation programs that include training all employees involved in the operation.

4.3 Supplementary Rapid Response Cars

A three-year study of a HEMS base serving a mixed urban/rural region in Norway indicated that the shortcomings of the HEMS (requirements for suitable weather and acceptable landing sites) could be alleviated by having a Rapid Response Car (RCC) at the base to support or replace the helicopter missions when required. During the study period 4,777 requests for HEMS were received and the RCC carried out 752 of these missions either due to the proximity of the incident or in 247 cases as a substitute for the helicopter due to poor visibility conditions or the helicopter requiring maintenance. "*The extra cost of equipping the HEMS with the RRC was on average EURO13 300 per year, increasing the running cost of the base by less than one percent*". It was proposed that at certain HEMS bases it would be feasible to supplement the helicopter with such an RCC[61].

4.4 Effects of Air Ambulance Admissions on Receiving Hospitals

Admissions by air ambulance place a high demand on orthopaedic services at the receiving hospital and the patients often come from outside the hospital's usual catchment areas. For example, hospitals such as Frenchay in Bristol, a level 2 trauma centre, has seen a five-fold increase in air ambulance admissions in the last six years, "*this has had an impact on the orthopaedic department regarding the treatment of these patients who often require multiple operations, intensive care beds and extensive rehabilitation*"[62]. This example indicates that the trend in increased use of air ambulances has implications for the receiving hospitals in terms of inpatient beds, medical staffing, theatre lists and rehabilitation. Additional impacts include the training of surgeons with multi-trauma patients and the scope for use of trauma teams.

5. Concluding Comments

The potential benefits of Air Ambulances lie in the speed with which medical help can reach the site of injury or illness, and the faster return to hospital of the patient. However, as has been highlighted in the literature, air ambulances are very expensive to run and on occasions have been involved in fatal accidents, mainly in the US. As with all medical services, it is proposed that there should be "*continuing critical review of the investment… More generally the rigour of published evaluations of air-ambulance services leaves much to be desired*"[63]. The work of the AAWG described above should go towards alleviating this perceived lack of critical evaluation for the UK.

The Report of the National Confidential Enquiry into Patient Outcome and Death (NCEPOD), *Trauma: Who Cares?* (2007) summarises the current trauma care provision in England, Wales, Northern Ireland and the Off Shore Islands. The overall aim was to examine the process of care for severely injured patients and identify variations that affect the achievement of agreed endpoints. The patients included in

[61] Nakstad, A.R. (2004), Rapid response car as a supplement to the helicopter in a physician-based HEMS system, *Acta Anaesthesiol. Scand*., **48**, 588-591
[62] Williams, M.E. and Harries, W. J. (2003) The effects of air ambulance admissions on orthopaedic trauma services in a single hospital, *Injury Int. J. care Injured*, **34**, 13-15
[63] Naylor, C.D. and McLellan, B.A. (1996), *Lancet*, **347** (9012), pg 1348

the study were identified prospectively over the period 1st February 2006 to April 30th 2006 and were chosen based on a specific Injury Severity Score[64].

The NCEPOD Report notes that overall, the picture regarding mode of transport is complex and that there is a "*potential danger in making assumptions regarding the appropriateness of the mode of transport in any individual case if conclusions are drawn from aggregated data derived from a heterogeneous population*"[65].

The Report highlights that helicopters should not only be considered as a mode of transport, but also as a system of care, with the potential to rapidly deliver a doctor with trauma expertise to the scene of the incident. However, given the significant expense involved in operating helicopters, the Report notes that it is important that a detailed audit of the value of helicopter transport is undertaken[66].

The Report summarises the contribution of helicopters within the NCEPOD study as follows,

> "*helicopter transport was used for 11.7% of the severely injured patients in this study, with most episodes taking place in daylight hours. Treatment and transport by a helicopter based team compared to a ground ambulance-based team was associated with a longer on scene time (36.9 minutes v 25.3 minutes) and a longer total prehospital time (77.4mins v 55.2mins). However, the patient was more likely to be intubated (41.1% v 7.3%), less likely to arrive at hospital with a completely or partially blocked airway, more likely to be triaged to an appropriate hospital (100% v 93%) and less likely to require a secondary transfer (11.9% v 25.5%)"*[67].

Some of the specific conclusions of the study regarding helicopter involvement in prehospital care are outlined below:

- **Rapid Response Times** - this particular study found it difficult to find data to support the generally accepted belief that rapid response times are essential as it found no clear evidence to support the association of response time with better outcome. The group of patients with the fastest response time (0-5min) had a percentage mortality of 21.7% and this was not lower than the rest of the population studied, for example patients reached in a response time of 26 – 30 minutes had a 22.2% mortality rate and those over 30 minutes, 15.4% mortality[68];
- **Day versus Night transfers** - of 759 patients studied 83.3% arrived by ambulance and 11.7% arrived by helicopter. The study found that helicopters were much less likely to be used at night and approximately 75% of helicopter transfers occurred during daytime hours[69];
- **Prehospital Timings** – The Report notes that the role of helicopters in the management of trauma victims remains controversial and notes studies from

[64] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 17
[65] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 42
[66] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 42
[67] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 42
[68] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 38
[69] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 39

the USA where total time from alert to arrival at hospital was significantly longer in all types of location by helicopter as opposed to road ambulance. In the NCEPOD study "*there was a greater time to reach hospital from the time of the emergency call, and an increased time spent at the scene of the incident, for those patients transported by helicopter. The longer time spent at the scene…could, in part, be attributed to there being a doctor on the scene, and of the patient being intubated before transfer*"[70].

- **Patient Airway Management** - from the cases where it could be determined, 41.1% (23/56) of patients transported by helicopter were intubated at the scene versus 7.3% (32/440) of those patients transported by ambulance[71];
- **Secondary Transfer** - the likelihood of requiring a secondary transfer was lower if the patients mode of arrival was by helicopter with 11.9% (7/59) of the 449 patients studied requiring a secondary transfer in the helicopter group and 25.5% (112/440) of those transported by ambulance[72]; and
- **Appropriate Transfer** – all patients arriving by helicopter had been taken to the appropriate hospital, however it was deemed that 7% (31/440) patients transported by road were taken to an inappropriate first hospital[73].

Three main barriers have been highlighted in the literature as currently preventing a greater role for air ambulances in the UK. The first barrier is continually raising sufficient funding as presently air ambulances in England and Wales are run by charities and NHS support is usually limited to paying the costs of paramedics who fly with them. An exception to this is the London Air Ambulance, which gets some funding from London primary care trusts and has always flown with trauma doctors and can carry out surgery on the spot. Some air ambulance services would welcome funding from the NHS in order to have doctors on board in addition to the paramedics. The Department of Health position on this is that it is a matter for local NHS bodies to consider[74].

The second barrier is related to the funding aspect and is the independence from the NHS. The Chair of the Association of Air Ambulance Charities believes that air ambulances in England "*want to remain charities and none would want to go down the Scottish route of a fully funded and managed service. There are freedoms that air ambulances hold dear such as taking a patient to what they judge to be the most appropriate hospital – which might be a specialist hospital further away than a local one*". The Association would, however, like to see the NHS meet the costs of employing emergency doctors; clinical governance; drugs and dressings[75].

The third barrier is night flying as it has been stated that to "*equip a helicopter with the level of equipment the Civil Aviation Authority would like to see for night flying*

[70] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 40
[71] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 41
[72] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 42
[73] Trauma: Who Cares?, A Report of the National Confidential Enquiry into Patient Outcome and Death, 2007, page 42
[74] Moore, A. (2008), Lift-off for air ambulances as government comes calling, *Health Service Journal*, 20th March 2008
[75] Moore, A. (2008), Lift-off for air ambulances as government comes calling, *Health Service Journal*, 20th March 2008

would cost £1m – beyond the reach of many charities"[76]. However, as discussed in section 4.2 above the issue of safety must be paramount and the example of the fatal crashes of air ambulances in the US is a lesson for any country wishing to establish an air ambulance service. The US has a segmented and rapidly growing sector and some US "*operators use less expensive helicopters lacking some of the more sophisticated safety features than hospital-based helicopters*"[77].

[76]Moore, A. (2008), Lift-off for air ambulances as government comes calling, *Health Service Journal*, 20th March 2008
[77] Safety Rules Can't keep Pace, USA Today, 19th July, 2005