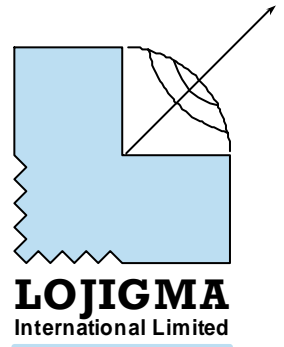


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Technical Excellence in Personal Protective Equipment (PPE) clothing for HEMS / EMRS / Ambulance Medical Team

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1. Introduction

Emergency Medical Teams attend patients in remote areas and in rapid response emergency situations using helicopters and/or ambulances.

To date, there are no specific CAA or JAR-OP recommendations about the use of PPE for medical personnel in air ambulances; the only recommendations are safety and survival equipment for offshore installation workers^(Ref. 1). However, this does not negate an employer's responsibility under HSE legislation.

In the past, Lojigma have approached ECS/cabin safety section of CAA in the UK for their advice. They suggested that "operationally it may be a good idea to have a flammability standard, not so much in relation to the aircraft aspect but the rescue work itself".

The other aspect of operational work of the medical team may involve dealing with patients who may be contaminated by their own body fluids from injuries sustained at an accident. Medical teams may need to work in inclement weather or where there is chemical contamination from spillage during an incident.

The selection of specific type of personal protective equipment (PPE) clothing must include a risk assessment of the hazards encountered during helicopter/ambulance missions. This will vary from service to service, depending on the nature of the mission (primary or secondary mission), the transport modality used (fixed for rotary aircraft, road etc.) e.g. any mission such as specific hazards with Major Incident Response/CBRN, RTC, over-water mission, helicopter/ambulance crash and fire related injuries to patient and/or Medical Team.

Simple 5 Steps to Risk Assessment (HSE)

According to HSE publication, a simple 5 steps process is advocated as follows:

- Identifying the risks
- Who might be harmed ?
- Evaluate the risks and decide on precautions
- Record your findings
- Review your actions regularly

It is important to review your PPE clothing requirements for your Medical Team who may be involved in various types of rescue scenario.

2. Extensive range of one piece and two piece suits offered by Lojigma for HEMS / EMRS / Ambulance Medical Team

In close co-operation over many years with Dr S Hearn (Consultant in Emergency Medicine, Royal Alexandra Hospital, Paisley, Scotland, UK) who is responsible for the provision of emergency care to the populations of Southern Western Isles of Scotland, Lojigma have developed various ranges of one piece and two piece “DURABLE AND INHERENT FLAME RETARDANT SUITS” in practical styles which allow free movement and functional requirement of medical team attending a patient via helicopter or outdoor situation with varying weather conditions.

2.1 Important considerations for choice of fabrics/components for PPE clothing

It is important to record that based on nature of HEMS / EMRS / Ambulance mission, risk hazard for all medical team must be clearly established and controls/appropriate personal protective equipment (PPE) clothing must be available at their work place.

HEMS / EMRS / Ambulance missions may include attending road traffic accidents or missions may include over-water flights.

When selecting appropriate PPE clothing, there are a number of key properties to be considered, such as:

- Durability to permanent flame retardancy (after laundering) during the useful life of suits in order to offer maximum protection possible in the event of flash fire scenario.
- Water repellent or
- Waterproof for superior liquid resistance against blood, body fluids, battery acids (37% sulphuric acid), gasoline (ASTM ref. Fuel C), hydraulic fluid (phosphate ester)
- Windproof / breathable
- High visibility (such as high visibility yellow as per EN471 for attending road traffic accident victims)
- Knee/elbow pad – protective components using specialised KEVLAR® fabric for resistance to penetration of glass/metal and grit during access whilst dealing with patients
- Hard wearing, durable and cost effective

2.2 Lojigma choice of fabrics/components for PPE clothing

Using various European (EN) and ASTM (USA) standards for high technology “durable and inherent flame retardant” fabrics, Lojigma offer various one and two piece suits for protective wear during summer and winter when attending medical incidents for HEMS / EMRS roadside accidents.

2.2.1 Key considerations relating to choice of flame retardant fabrics

It is important to record that there are mainly two types of flame retardant fabrics, namely

1. Fabrics with “Flame Retardant additive” treatment

Fabrics such as cotton or polyester/cotton blends are often pre-treated with “flame retardant additives” (such as Proban[®] or Pyrovatex[®]) to inhibit flammability (of fabrics).

It is important to note that it has been stated ^(Ref. 2) that some of the wash process parameters that may affect flame retardancy are:

- high levels of alkalinity;
- excessive mechanical action;
- natural detergents, such as pure soaps;
- chlorine bleach; and
- poor soil removal contributing to combustibility.

2. “DURABLE AND INHERENT FLAME RETARDANT” Fabrics

Fabrics with “DURABLE AND INHERENT FLAME RETARDANT” fibres characteristics (NOMEX[®], KEVLAR[®], flame retardant Modacrylic and cellulosic viscose Lenzing FR[®] etc.)

It is a known fact that “DURABLE AND INHERENT FLAME RETARDANT” fabrics are more superior than “FR additive” treated fabrics in terms of retaining flame retardancy characteristics.

Over the last 25 years, the use of “DURABLE AND INHERENT FLAME RETARDANT” fibre containing fabrics, such as **NOMEX[®]/KEVLAR[®]/PBI/Lenzing FR[®]** are the most commonly used for fire-fighters, military and helicopter personnel and police authorities PPE clothing in public services in Europe and USA.

These fabrics offer much greater resistance to alkali and chlorine which allow them far better stability in wash and care procedures. As the **fibres are inherently flame retardant**, incorrect processing will minimally adversely affect the flame retardancy. However, good laundering is also essential for effective removal of combustible soil during the useful life of suits.

3. Range of specialised “Durable and Inherent Flame Retardant PPE suits” developed by and available from Lojigma International Limited

Lojigma offer a unique service for HEMS / EMRS / Ambulance Medical Team suits used in Helicopters/roadside and provide badges and ID tags. Each suit is individually barcoded for total product component history, customer purchase order, fabric batch used etc. They are manufactured in UK by Lojigma under control of their ISO 9001 Quality Management System and personal attention is given for the development and supply of personalised clothing systems for HEMS / EMRS / Ambulance Medical Teams.

3.1 One piece “water repellent” suit made from NOMEX®/KEVLAR® blend fibre with antistatic conductive fibre for static control complies with Annex II of the Directive 89-686-EEC for PPE for use in explosive atmosphere.

In addition, NOMEX®/KEVLAR® fabrics meet the essential certification for EN 531 and EN 532 heat and flame European Standards.

Namely: one piece suits:

- Colour *RED* or *ORANGE*: EMRS Helicopter suit, style R2066
- Colour *RED* or *ORANGE*: HEMS Helicopter suit, style R1948
- High Vis *YELLOW* (as per EN 471)/*RED Shoulders/GREEN* back panels: style R1950

Note: *Water repellent suits are more comfortable to wear, however, they are not waterproof or windproof.*

3.2 One piece “waterproof” suit made from 2 layers of combination of NOMEX®/KEVLAR®/CROSSTECH® SR fabric with liquid resistance to blood and body fluid/battery acid (37% Sulphuric)/gasoline (ASTM ref. fuel C), hydraulic fluid (phosphate ester).

Suits are made using outer layer of flame retardant NOMEX®/KEVLAR® fabric as per 3.1 above in Red, Orange, Green and high vis Yellow (EN471) colours in combination with inner layer of unique (flame retardant, liquid resistant to blood and body fluid) breathable CROSSTECH® SR fabric developed by W L Gore & Associates, we offer various styles of one piece waterproof suits as detailed below.

Waterproof version of one piece suits:

- Colour *RED* or *ORANGE*: style R1626
- High Vis *YELLOW* (as per EN 471)/*RED Shoulders/GREEN*: style R1612

- 3.3 Two piece “waterproof” suit** made from NOMEX[®]/KEVLAR[®]/CROSSTECH[®] SR fabric liquid resistance to blood and body fluid/battery acid (37% Sulphuric)/gasoline (ASTM ref. fuel C), hydraulic fluid (phosphate ester).

Using the combination of above reference fabrics (as per 3.2), Lojigma offer **two piece suits** (consisting of Jacket and Trousers) in following styles:

Waterproof Jackets and Trousers:

- Colour *RED* or *ORANGE*: Jacket - style R1900 and Trousers – style R1901
- High Vis *YELLOW* in combination *with Green* or *Red*: Jacket - style R1911
Trousers – style R1912

- 3.4 “Helicopter Medical Transfer suit” consisting of a waterproof Jacket** made from NOMEX[®]/KEVLAR[®]/CROSSTECH[®] SR fabric liquid resistance to blood and body fluid/battery acid (37% Sulphuric)/ gasoline (ASTM ref. fuel C), hydraulic fluid (phosphate ester) **combined with non-waterproof Trousers** made from NOMEX[®]/KEVLAR[®] fabric.

Waterproof Jacket

- Colour *GREEN*: Jacket - style R2035

Non-waterproof Trousers

- Colour *GREEN*: Trousers – style R2036

4. Additional Notes for PPE clothing supplied by Lojigma:

- A. *Protective clothing standards (Certifications) refer to “state of the art” fabric and components used by Lojigma for HEMS / EMRS / Ambulance Medical Team flame retardant NOMEX[®]/KEVLAR[®] suits as follows.*
- EN 471 for high visibility yellow
 - EN 531 / EN 532 for heat and flame
 - Antistatic prEN 1149-3
 - Waterproof ISO 811 (flame retardant inner layer of CROSSTECH[®] S/R fabric)
 - Viral barrier: ASTM F1617 (Bio-Penetration Resistance – inner layer of CROSSTECH[®] S/R fabric)
 - Retro reflective flame retardant tapes (EN 533 Index 3)
 - Knee pads (KEVLAR[®]) EN 469 : 1996-01 and EN 532, EN 343
- B. One piece and two piece waterproof suits are registered as a Class 1 medical device (i.e. CE marked) as specified by the Medical Devices Agency (London), our registration reference being CA001035.
- C. All one piece FR one piece suits and FR two piece suits are supplied with KEVLAR[®] utility belt, radio docking (Airwave type) and retro reflective ID plate at back with encapsulated badges at front.
- D. Lojigma also offer “non flame retardant” high visibility one piece and two piece clothing made from **ROTECNO[®]** medical fabric – details available on request.

References:

1. “Personal Protective Equipment (PPE) in the EMRS Service” – a Poster presented by Dr Scott Hepburn at Transfer & Retrieval Conference at Glasgow on 7th May 2009.
2. “Retaining Retardancy” by Ian Harris – Laundry and Cleaning News July 2008, pages 35-36.

***Warning:** No products, including garments, footwear or handwear, can offer absolute protection, even when new, and their protective performance will decline with wear, tear, abrasion and other damage associated with use.*

Please note Lojigma International Limited will not be liable for any misuse or misrepresentation of any information/wash and care recommendations provided for their products which are supplied without guarantees. Minor repairs may possibly be carried out by Lojigma at the user’s expense (price available on application).

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ROTECNO is a registered trademark of Rotecno AG, Switzerland
LENZING FR is a Lenzing Aktiengesellschaft

***Authors’ Expertise**

***Dr Suresh R Patel** graduated in 1979 from Leeds University with a Ph.D. in flame retardancy of blended fabrics/ textiles. Dr Patel also studied the effects of flame retardant additives in relation to thermal/chemical reactions at elevated exposure temperatures on blended textiles for flame retardancy..*

In addition Dr Patel has various technical textiles degrees and participated as UK expert for CEN/TC 205/WG 14 Committee since 1996 from BSI England for the development of European Standard EN 13795 for surgical gowns and drapes as medical devices for the operating room in European hospitals.

***Mr John Duncan** has a Chemical Engineering degree and has worked in chemical/ pharmaceutical and textile industries for more than 35 years.*

***Dr Patel and Mr Duncan** have together been actively involved for directorship of Lojigma International Limited for the last 25 years for the development of many technically excellent reusable textile based medical devices.*

Dr Patel and Mr Duncan are holders of many international patents for various types of medical devices used in many hospitals throughout the world.

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