Future Developments – Personal Protection

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DuPont de Nemours International S.A., Geneva, Switzerland

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Chief Fire Officers' Association

hosted by the

Cavan County Fire Service

Ballyconnell, Co Cavan, Ireland

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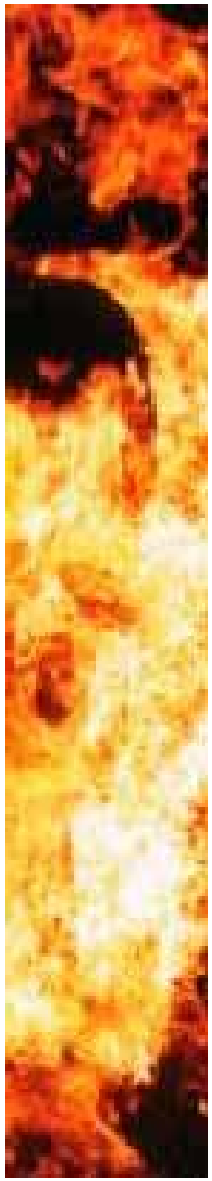
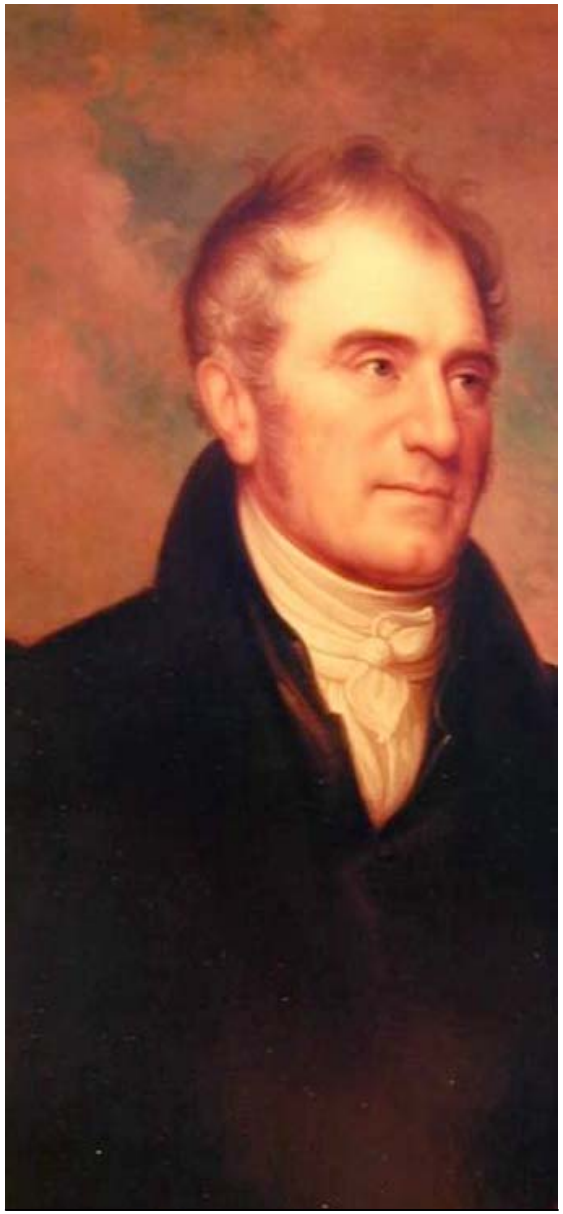
The miracles of science™



Agenda

- DuPont, a brief overview
- Trends in PPE
- Examples to meet new risks & threats



DuPont - a brief overview

Our heritage:

200 years of science

A worldwide reputation as a leader in safety and protection

DuPont is a science company

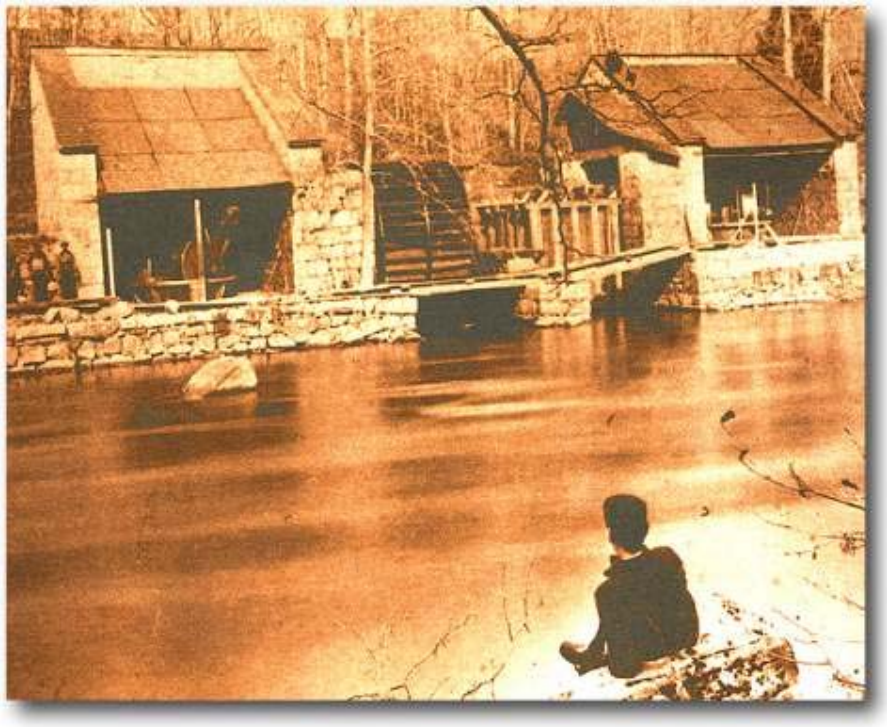
Founded in 1802, DuPont puts science to work by creating sustainable solutions essential to a better, safer, healthier life for people everywhere.

Operating in more than 70 countries, DuPont offers a wide range of innovative products and services for markets including agriculture, nutrition, electronics, communications, safety and protection, home and construction, transportation and apparel.

We use science to solve problems, making a better, safer and easier life.

DuPont - a brief overview

E. I. du Pont de Nemours



First powder mill of DuPont,
Wilmington, Delaware – 1865

DuPont - a brief overview

DuPont Experimental Station – 1903

DuPont - a brief overview

1938:
DuPont introduces
NYLON

DuPont - a brief overview

1938:
Roy Plunkett invents

Teflon®

DuPont - a brief overview

1962:
Invention of
NOMEX®

DuPont - a brief overview

1970:
Invention of
KEVLAR®

DuPont Personal Protection Portfolio of Products

Cut Protection		KEVLAR®	
Heat & Flame Protection		NOMEX®	
Chemical Protection	TYVEK®		TYCHEM®

Product Portfolio
in the Emergency Response Services

DuPont Personal Protection

KEVLAR®

NOMEX®

1. Elasticated facial opening
2. Stitched and overtaped seams
3. Elasticated cuffs and ankles
4. Double self-adhesive zipper flap

TYCHEM® TYVEK®

1. Large, laminated visor with superior mechanical and chemical resistance
2. Gas-tight zip
3. Gas-tight locking cuffs
4. Gas-tight locking ankles

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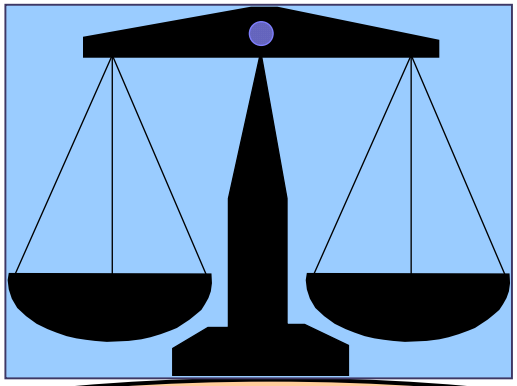
3 decision making factors to balance

economics √



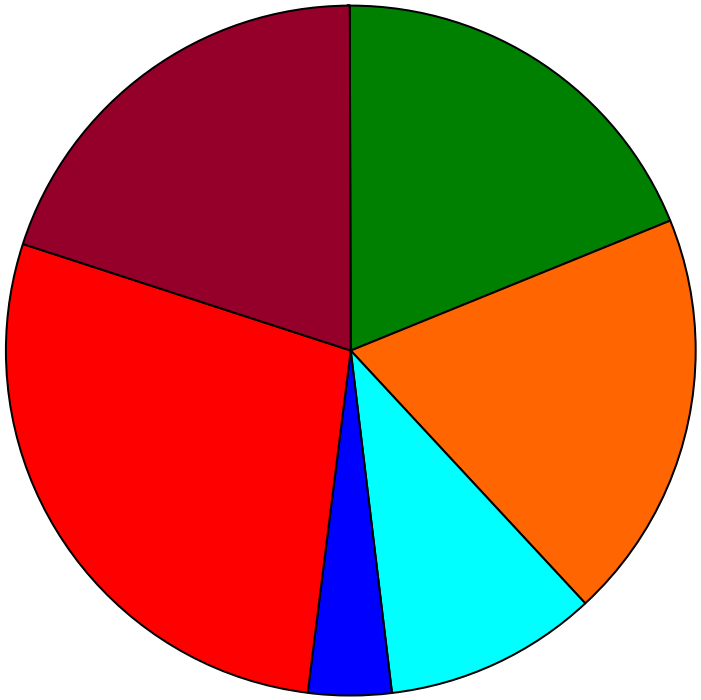
protection √

comfort √

DuPont Personal Protection
Garment manufacturers in the partner program

Protection & Comfort

Firefighter Feedback



Feedback of German Fire Fighters after controlled weartrials of various different kits

Heat Protection is essential but already well accepted and proven in current solutions

Today's turnout coat system are causing sweating and feeling hot after a short time, comfort is highly rated by the fire-fighters

As the turn out coat's are heavy and reduce movements the ergonomics considered important

Due to budget constraints, economics have an impact on the final decision

Good mechanical properties are needed but current solutions are already well addressing the fire-fighters needs

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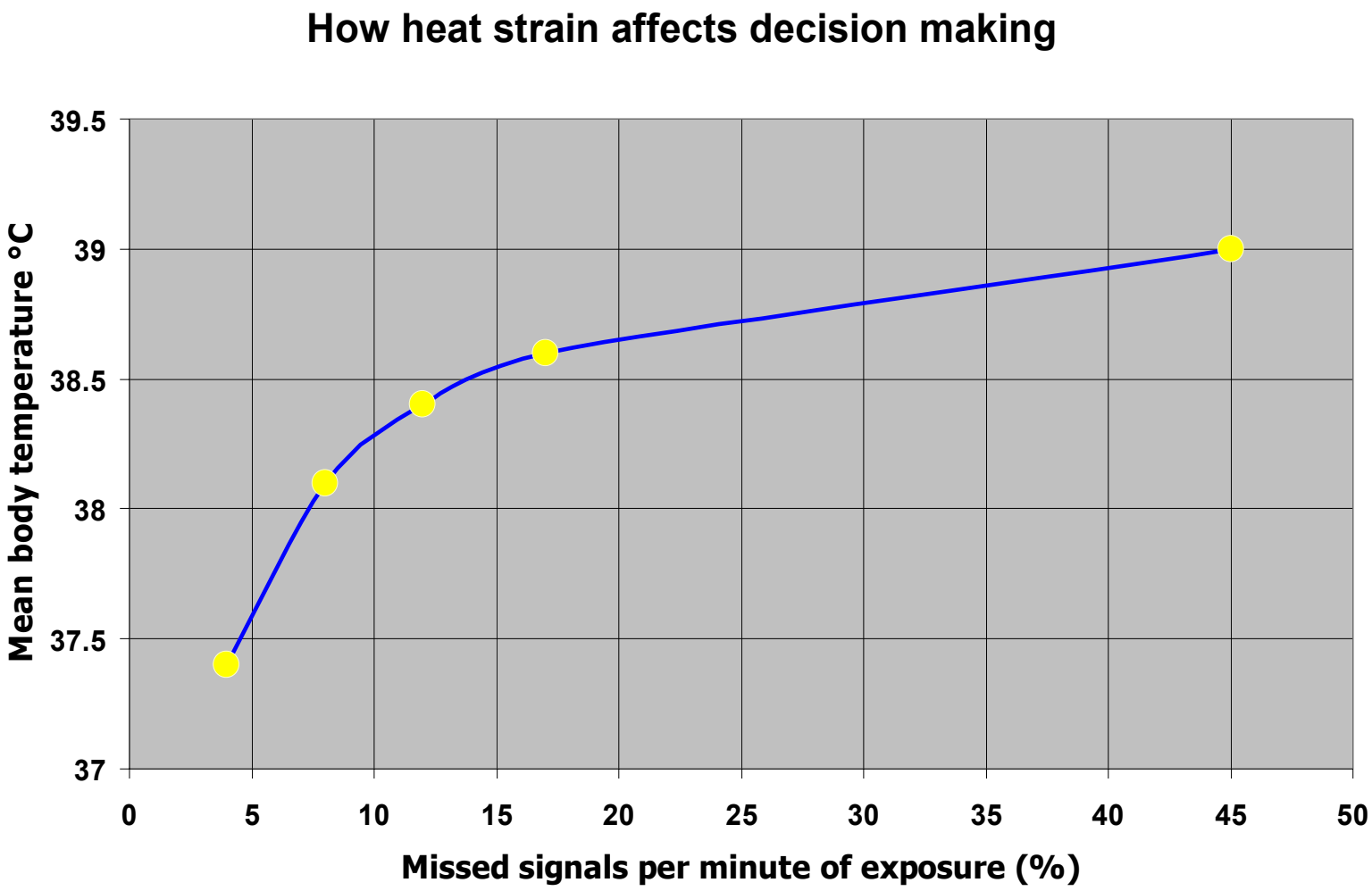
Protection & Comfort

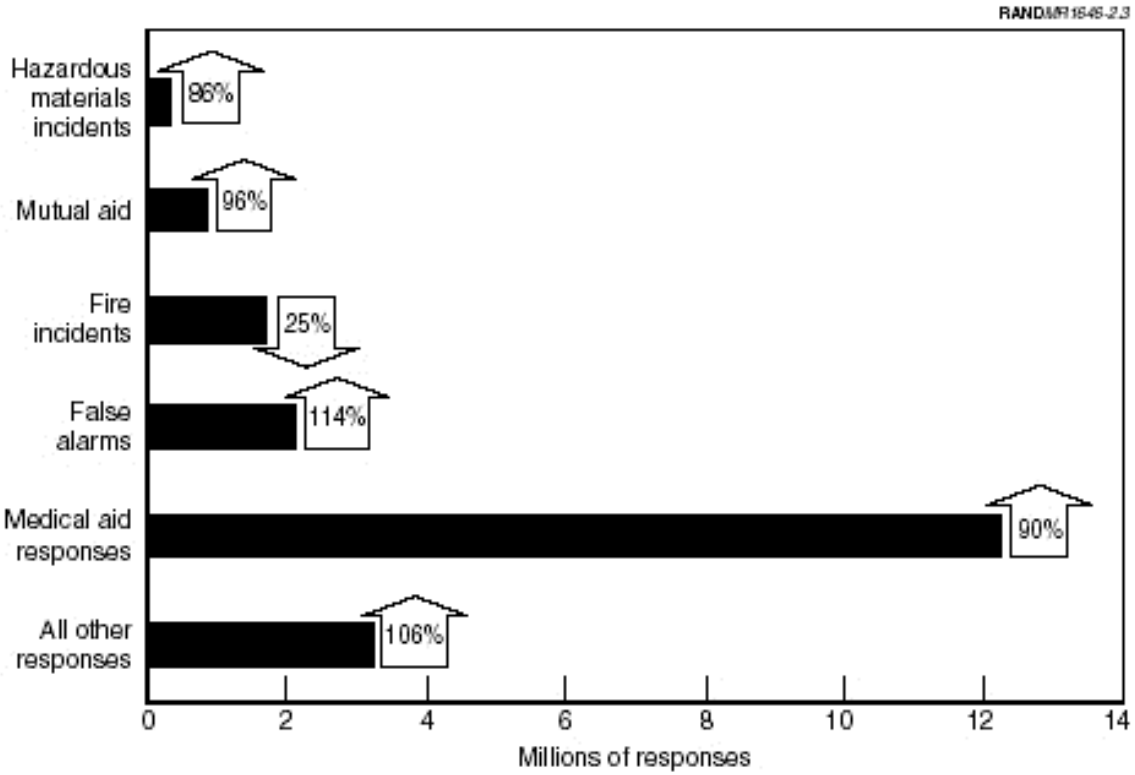
Heatstress



See Hancock 1986 Psy Bull 99 263-281
Benor & Shvartz 1971 Aerospace Medicine 42 727-730

Service Tasks and Trends

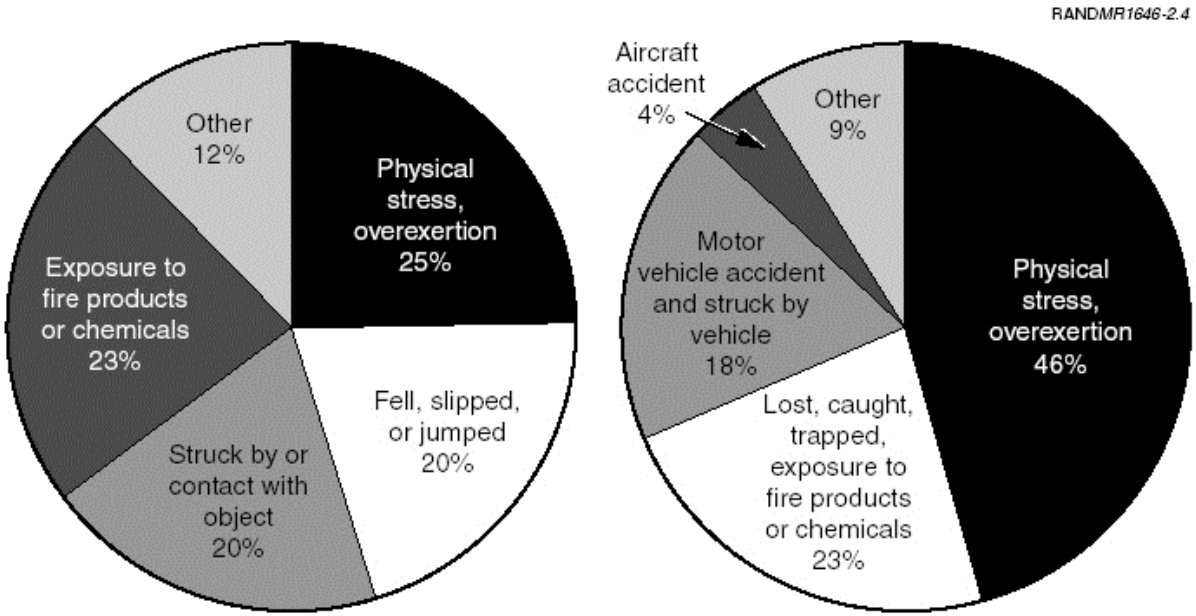
20 MM calls per year



SOURCE: National Fire Protection Association (2002a).

About 10 % of all calls related to fire incidents

Injuries and Fatalities in the US



88.000 injuries/year 95-2000

Injuries

Fatalities

97 fatalities/year 90-2001

NOTE: Injury data are for fireground only.

SOURCES: Injury data are from an analysis of the National Fire Incident Reporting System Firefighter Casualty Module (U.S. Fire Administration, 1998). This database captures data for approximately 10 percent of all firefighter injuries. Only moderate, severe, and life-threatening injuries occurring on the fireground, as defined by the database, are included here. Assaults and vehicle accidents are included in the "struck by or contact with object" category, and "exposure to fire products and chemicals" is broken out from that category. Fatalities data are from National Fire Protection Association (1995–2001).

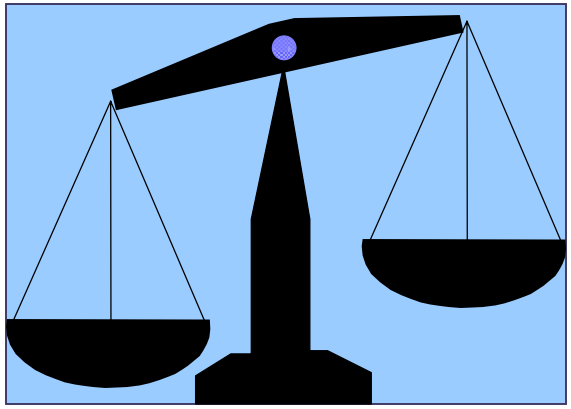
> About 50 % of all injuries are related to fire scenes

> Physical stress, overexertion main reason for injuries & fatalities

New Risks & Threats

require new dimensions in protection

? economics



? comfort

√ protection

- Heat & Flame (Radiant&Convective)
- Water & Chemicals
- **NEW RISKS, NEW ROLES FOR EMERGENCY RESPONDERS**

> large natural disasters

> terrorist attacks: - large in scale
- long in duration
- complex in terms of the range of hazards:
  - > bloodborne pathogens
  - > chem-bio protection
  - > debris, dust, smoke ...

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New programmes

to develop the fire fighting PPE of the future

- **RAND study on behalf of NIOSH**

Protecting Emergency Responders :
Vol2, Community views of safety and health risks and personal protection needs / Lessons Learned from Terrorist Attacks
- Tom LaTourrette ... [et al.].
http://www.rand.org/publications/MR/MR1646/
http://www.rand.org/publications/CF/CF176/index.html

- **North Carolina State University on behalf of U.S. Department of Homeland Security DuPont, Globe and various Fire Departments:**

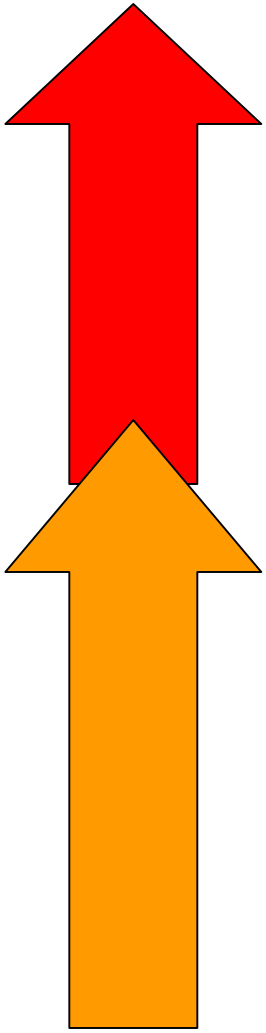
Development of the next generation of structural fire-fighting PPE, which will include chemical and biological agent protection.

- **IAFC, NSC/NPC, Int. P.P. Inc., Morning Pride Mfg, U of Massachusetts, U of Arkansas on behalf of NATICK:**

Next Generation Structural Fire Fighting Personal Protective Ensemble (PPE) with Chemical/Biological Protection, passing NFPA 1971 (structural fire fighting protection) and NFPA 1994 (chem/bio protection) standards.

Priorities defined by the Responder Community

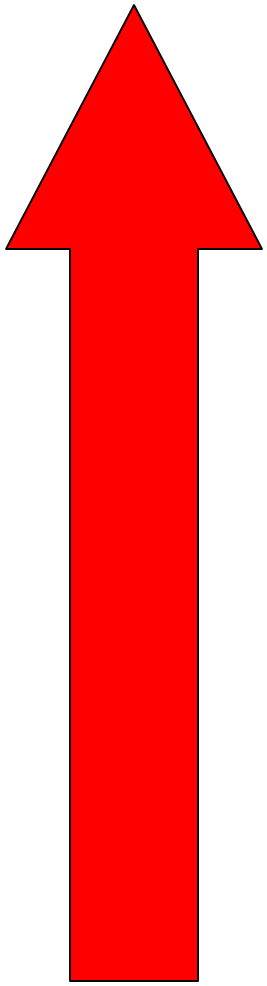
(RAND research)



- Comfort
- Interface
- C&B Protection *EMS*
- C&B Protection *FF*
- Integrity
- Training
- Best Practice

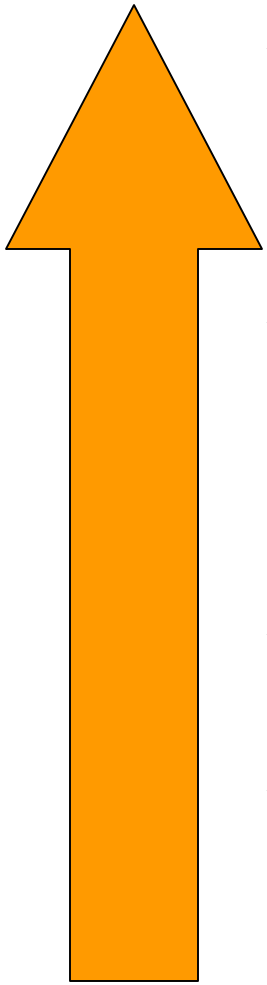
Priorities and Recommendations

of the Responder Community



Priorities	Specific Recommendations
Reduce physical stress/improve comfort Comfort	• Improve garment breathability • Reduce equipment weight • Ensure consistent/appropriate sizing of components • Enhance ergonomic characteristics
Improve communications Interface	• Make radio systems interoperable • Improve communications capabilities with SCBA • Improve radio design to allow hands-free use and use with gloves
Upgrade communicable disease protection C&B Protection	• Increase protective equipment options for EMS personnel and police

Priorities and Recommendations cont'd



Priorities	Specific Recommendations
Develop practical respiratory/chemical protection equipment and guidelines for first responders **C&B Protection**	• Improve chemical/biological protection of garments & respirators • Require more chemical/biological hazard training • Design equipment to minimize interference with responder activities
Improve PPT standby performance **Integrity**	•Develop integrity monitoring and service-life monitoring technologies • Enhance compactness/portability of protective equipment • Address logistical complications • Reduce protective equipment maintenance complexity and cost
Expand training and education **Training**	• Require more training on sophisticated protective equipment • Reduce complexity of new equipment
Benchmark best safety practices **Best Practice**	• Study/benchmark safety practices, particularly for EMS and police • Study/benchmark PPT enforcement practices

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Technologies to provide improved protection

Dimension	Subject	Short range	Long range
Fit for Function (Protection)	• Mission protective clothing (Fire, C&B) • Hand protection with improved dexterity • Improved garment integrity	➢ Limited use C&B protective garments ➢ Improved design and interfacing ➢ Consistent procedures	❖ Active Agents / Nano particles ❖ Indicator finishes and dyes ❖ Diagnostic tools, Smart tags
Comfort / Ergonomics	• Increased Heatloss and breathability • Lighter Weight • Better fit and ease of movement	➢ Body scanner ➢ Thermal imaging ➢ Improved pattern design ➢ Optimized layered fabric systems	❖ Functional Finishes & Dyes ❖ New Fibers ❖ Active Cooling
Compatibility / Modularity	• Integration of components • Multi-Threat protection	➢ Improved interfacing ➢ "stacked", layered protection ➢ Improved tender processes	❖ Distinct designs ❖ New coatings & materials ❖ SPM ❖ Full service provider

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Examples: Design, Colours

> Diversity
> Visibility
> Light fastness
> Wash fastness

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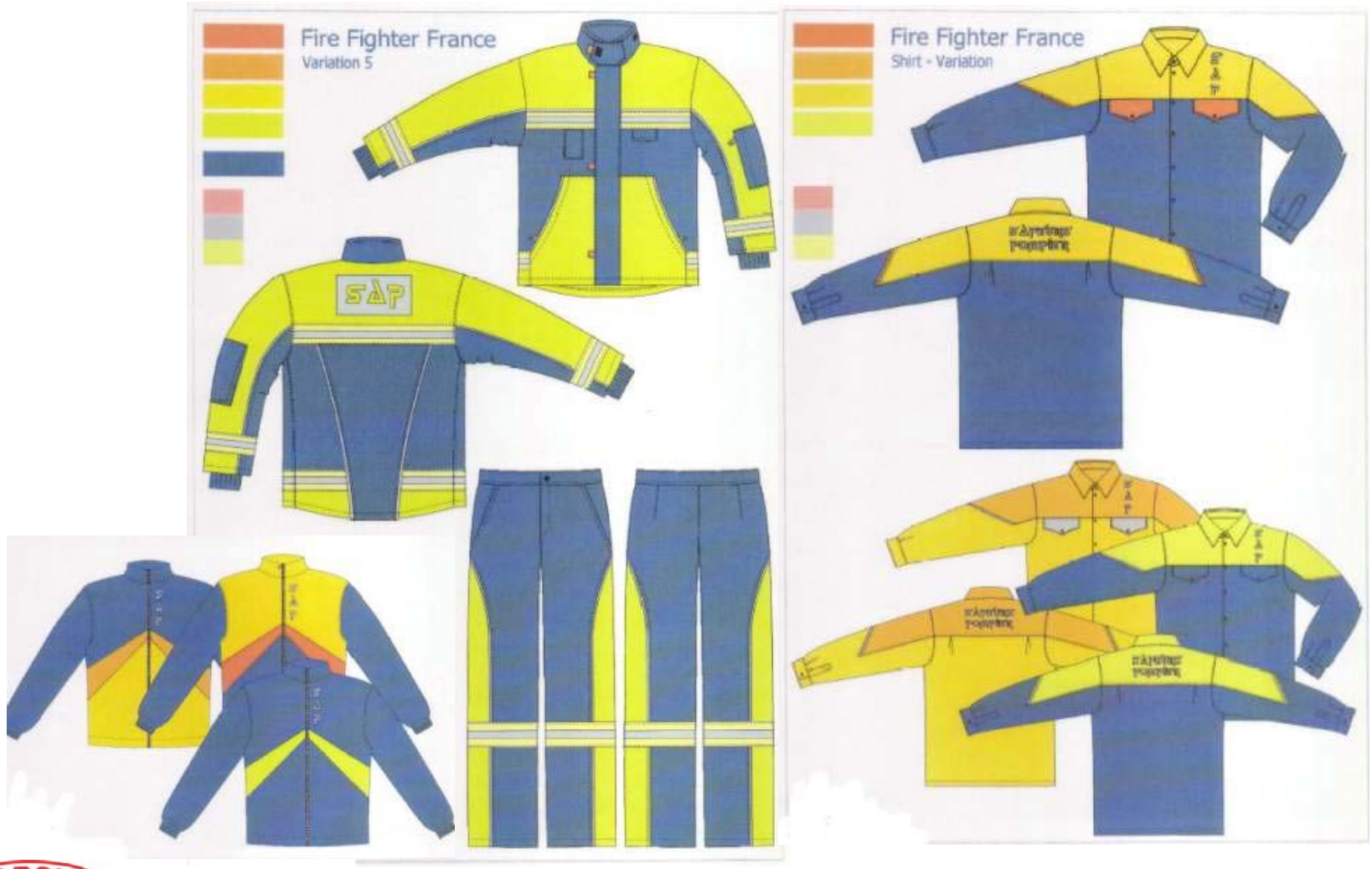
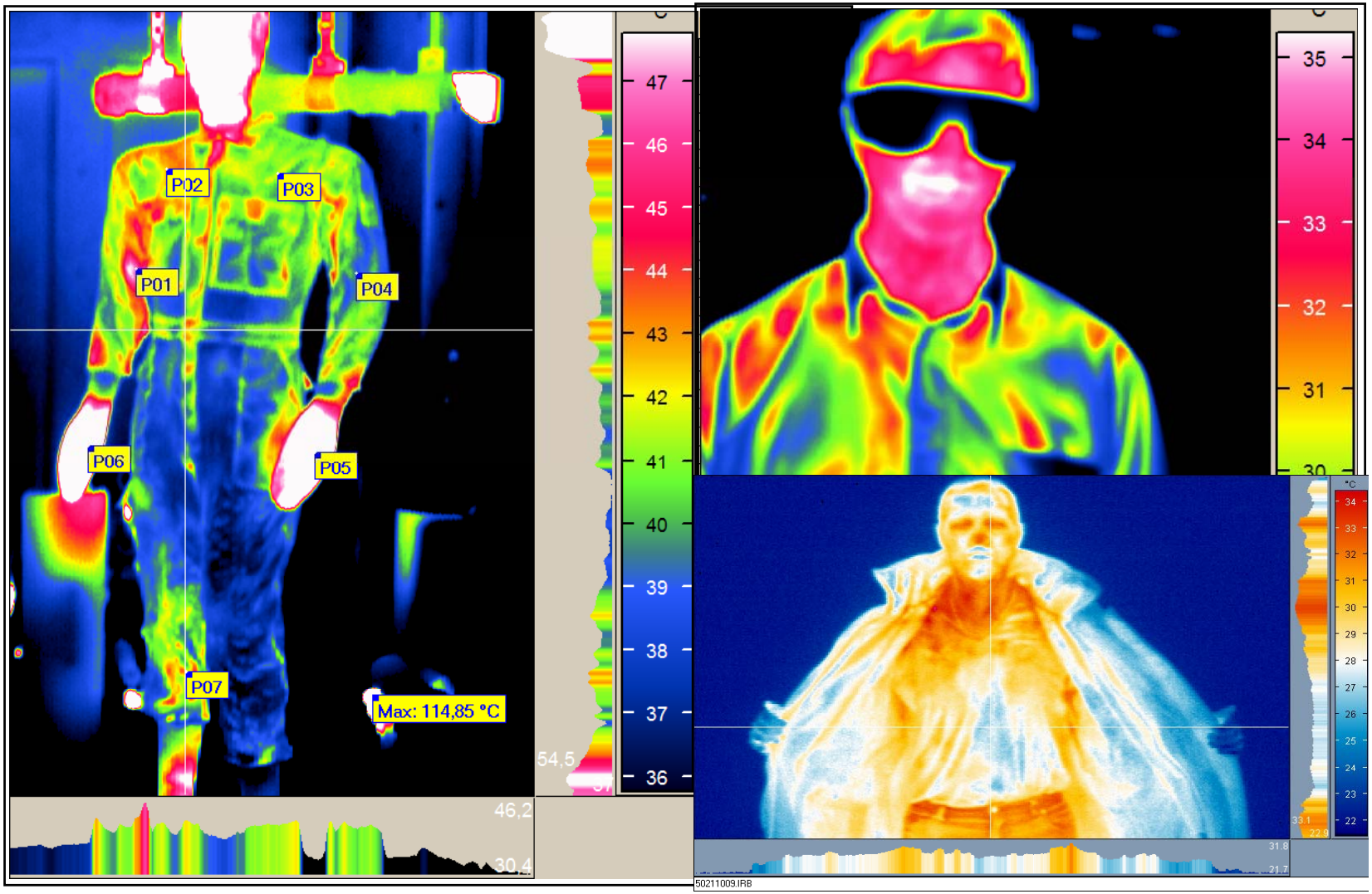
Examples: Design, Pattern/Ergonomics, CSP



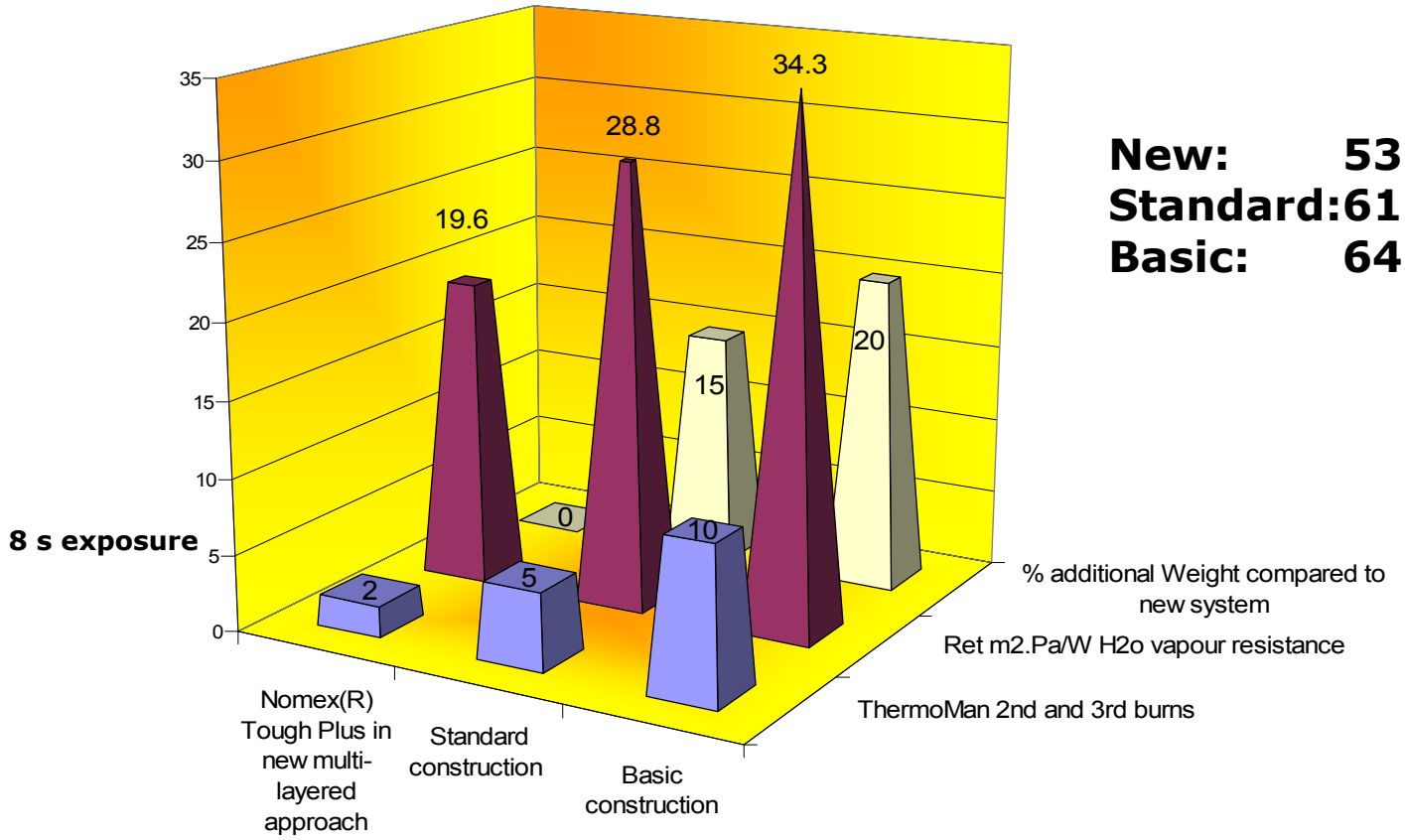
Examples: Compatibility, Modularity

Thermal Imaging



Examples: Comfort

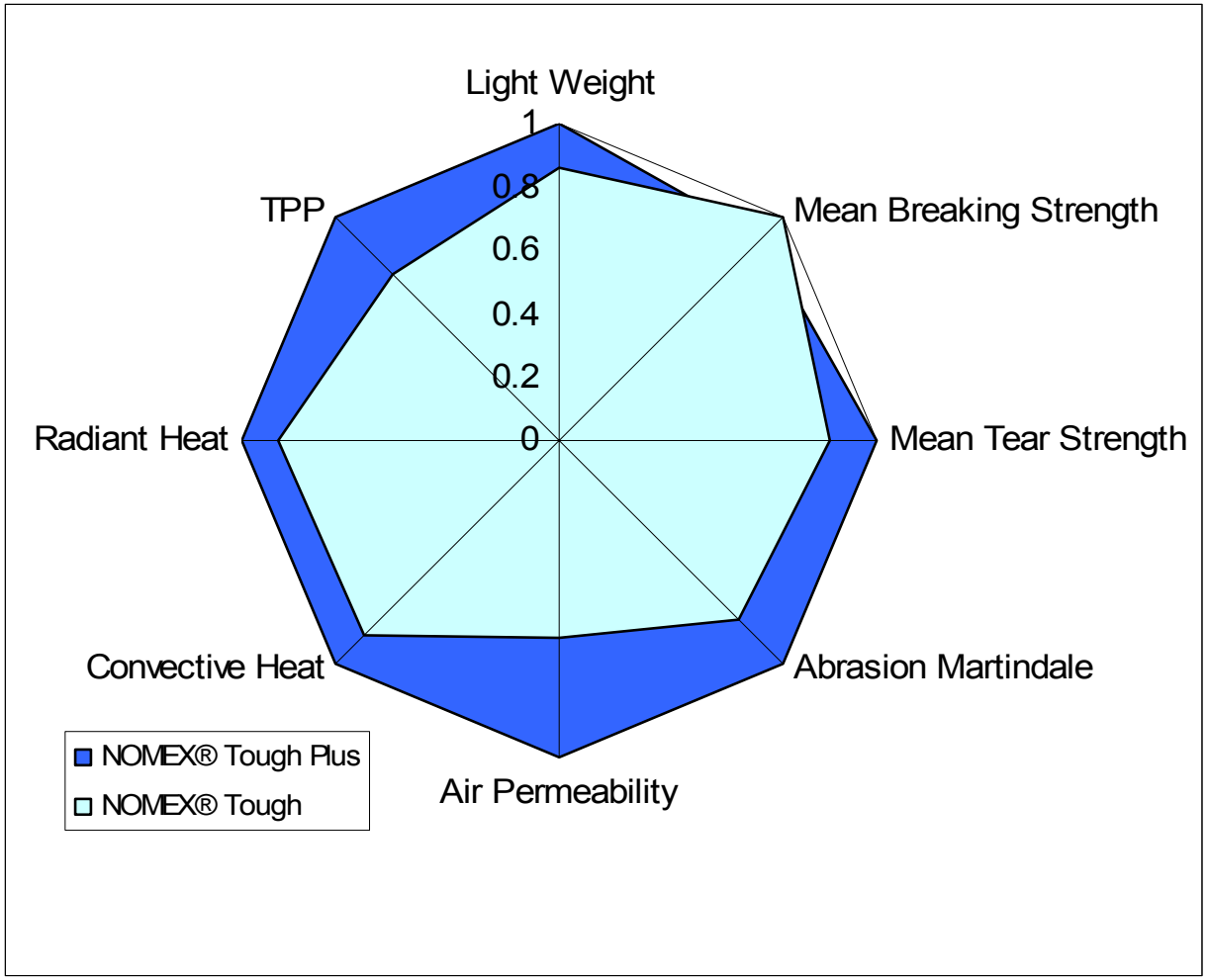
optimized layered fabric systems



New: 535 g/m2
Standard: 615 g/m2
Basic: 643 g/m2

Examples: Comfort

Tough^{Plus} step changing performance in protection & comfort



Examples: Compatibility/Modularity

Multi-Threat Protection

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THANK YOU for YOUR attention !

Questions ?

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