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Enriching lives through innovation

**Textile Effects**

# LivingTech—enjoy traveling

Providing comfort, color and performance

**Textile Competence**




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# LivingTech—enjoy traveling

**People on the move**—travel has become an integral part of modern life. Whether it be commuting on a daily basis, transcontinental business travel or tourism, at any given point in time billions of people are on the move. Because travel represents for such a significant aspect of our daily lives, issues such as comfort and safety have taken on a high priority.

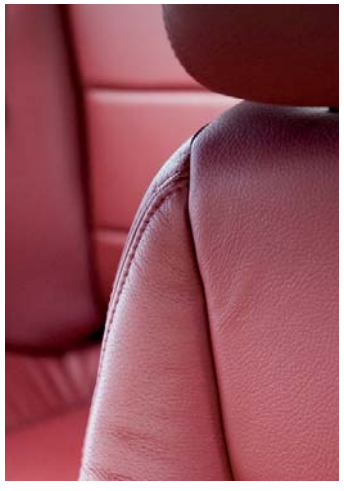
Functional textiles fulfill exactly these needs and contribute on the one hand towards greater comfort through their handle and on the other through visual appeal.

Over and above the comfort element, functional textiles also fulfill an extremely important role—that of safety both for public and private transportation.

The main features and requirements of functional textiles are:

- Light-weight (fuel saving >> reduction of $CO_2$-emissions)
- Fireproof (flame retardant >> safety)
- Light-fastness (value stability)
- Abrasion resistance
- Anti pilling
- Liquid repellency
- Color fastness to perspiration, dry cleaning, rubbing, washing and water
- Breaking strength and elongation

# Enjoy car travel




In modern society life without cars is virtually unthinkable and the automobile has moved from being just a means of transportation to becoming both an essential commodity as well as a status symbol. People spend so much time in their cars that the expectations are now similar to those of a home. Accordingly there is also an increasing trend to consume food and drink in cars. Regardless of these factors, consumers wish for the interiors to be visually and sensually aesthetic and remain that way. First class fabrics in car interiors can make all the difference!

## Ranking of key functions and effects— functional textiles for automotives:

- **Durability**
  (high temperature light-fastness, abrasion resistance)
- **Function and performance**
  (oil, water and stain repellency, antistatic)
- **Safety and protection**
  (flame retardant properties)
- **Cost savings**
  (enhanced productivity)

Single effects and various effect combinations are possible.

## Typical functional textiles used in automotives:

- Upholstery (seat covers) and carpets (tufted, needled)
- Seatbelts and airbags
- Filters (nonwovens such as cabin filters, engine filters, fuel filtration)
- Head liners and hood liners
- Trims (woven and knitted, for e.g. boot liners, head liners, door panels)
- Luggage racks (nets) and luggage covers
- Soft tops for convertibles

**Durability**
Car interiors are permanently exposed to severe conditions such as extreme temperatures, humidity, bright and low light, dust and dirt. Functional fabrics for automotive applications therefore need to achieve the highest degree of durability with respect to shade stability and abrasion resistance.

**Function and performance**
Reflecting today's fast-moving lifestyle, food and drinks are regularly consumed in cars. With this trend the risk of spillage is very high and automotive fabrics have to be able to protect against staining from foodstuffs. A repellent function helps protect the material against stains, and a release function helps improve the cleanability of fabrics where stains are rubbed into the fabric structure.

Another important performance feature for car textile interiors must be the ability to counteract against the build up of electrostatic charges (antistatic effect). This is a common problem familiar to everyone who has ever received an unpleasant "electric shock" caused by a combination of fiber selection, friction and humidity.

**Safety and protection**
Polyester and polyamide, synthetic fibers used for automotive interiors are extremely flammable. A glowing cigarette or a smoldering matchstick could easily ignite and start a fire. A flame retardant function is a must for functional textiles used in cars to prevent the fabric from catching fire.

**Cost saving**
Part of the optimized production processes which lead to increased output and cost reduction comes from minimizing second dyeing, spots and other reworking of fabrics for car interiors.

## Desired functions and effects for textiles used in private transportation vehicles:

- Flame retardancy
- Oil, water and stain repellency
- Durability of oil, water and stain repellency effect after abrasion
- Abrasion resistance of fabric
- Anti pilling
- Antistatic
- High temperature light-fastness
- Shampoo fastness
- Non fogging
- Hydrolysis resistance
- Molding resistance
- Operating fluids resistance
- High temperature resistance
- Resistance to prolonged heat exposure

# Enjoy flying

With globalization, the air transport industry plays a crucial economic role with rapid intercontinental connections. Furthermore, increasing competition in the skies makes air travel much more affordable—a boost for the tourism industry. Statistics show that more than 2 billion passengers are annually transported by airlines which translates to 30% of the world's population. These figures are on the rise at the rate of nearly 5% per annum. Judging by these numbers one can assume that passengers expect a high degree of comfort, even luxury on their flight.

Functional textiles play a significant role in contributing to the in-flight well-being of passengers through design and aesthetics as well as handle and performance.

## Ranking of key functions and effects—functional textiles for planes:

- **Safety and protection**
  (flame retardant properties)
- **Cost and resource saving**
  (weight reduction = $CO_2$ reduction)
- **Function and performance**
  (oil, water and stain repellency, antistatic)
- **Durability**
  (abrasion resistance)

Single effects and various effect combinations are possible. Analog to the key requirements of functional textiles used in other means of transportation with different emphasis on each specific function and effect!

## Functional textile elements in planes:

- Upholstery (seat covers)
- Cushion covers
- Curtains
- Carpets
- Headrests
- Wall coverings
- Filters
- Blankets
- Safety belts

Even more stringent performance and safety standards apply to furnishing and other accessory textiles used in aviation.

High on the priority list of regulations are the flame retardant (FR) properties of fabrics used in planes. The decisive criterion takes the worst case scenario: fire in a closed cabin during the flight and the time for an emergency landing including evacuation of the passengers. Given this criterion, FR-standards not only include the flammability and burning behavior of the fabric but also the measurement of the heat release, smoke density and development of toxic gases like carbon monoxide, hydrogen cyanide, nitrous gases and hydrogen fluoride.

Textiles in planes have to perform at a very high level with regard to durability, cleanability and fastness. The following examples demonstrate the expectations on functional textiles.

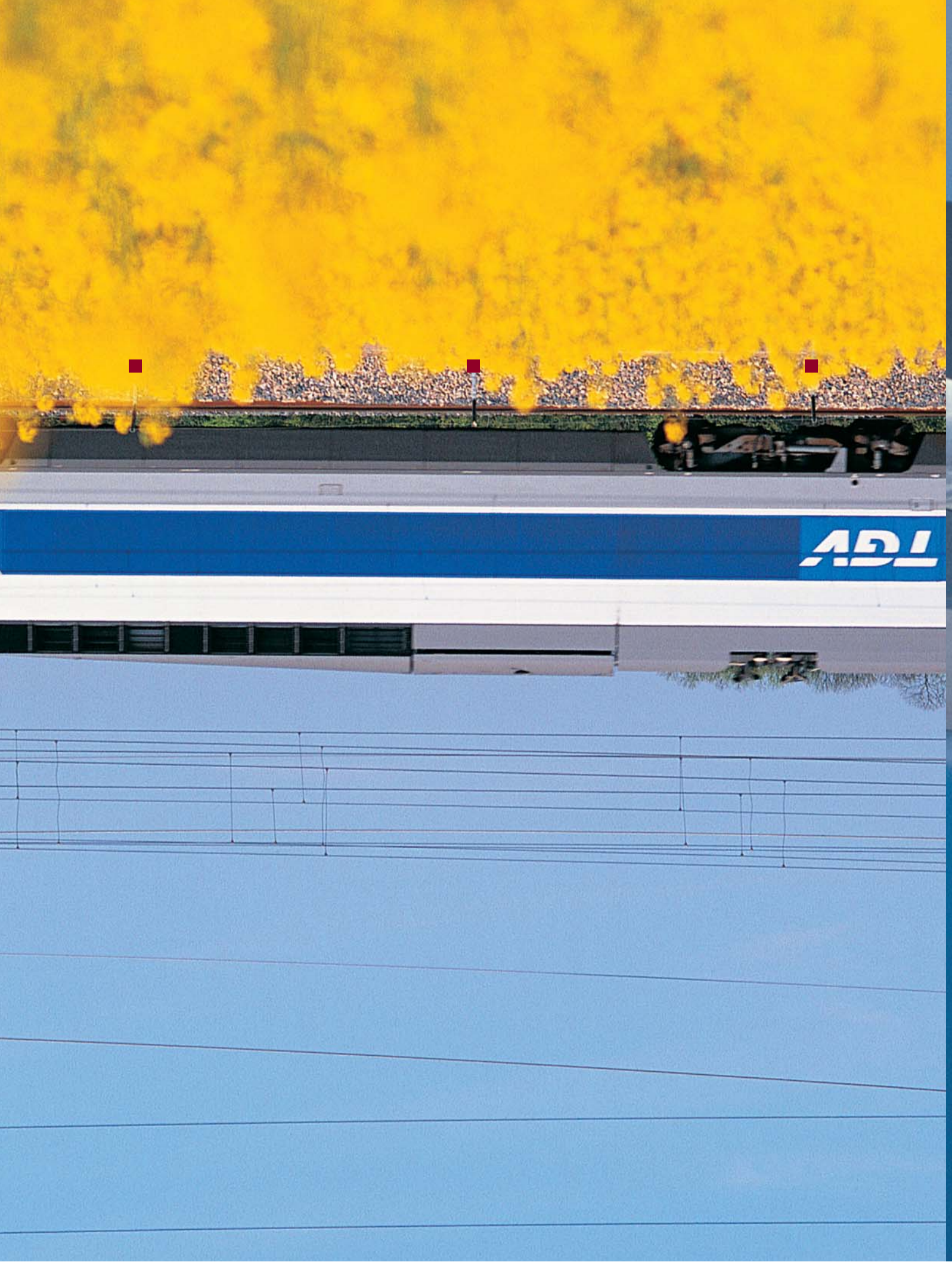
**Seat covers** are demounted 3–5 times a year and externally dry cleaned. They have a life expectancy of 2.5 years.

**Carpets** in the aisle are subject to constant stress caused by the catering trolleys. These carpets have to be replaced every three months.

Just these two examples and the fact that it is estimated that China alone will need around 2000 wide-bodied aircraft by the year 2020 highlights the potential for functional textiles in this segment.

## Desired and statutory effects for textiles used in planes:

- Flame retardancy including low development of toxic fumes in case of a fire and heat release (passenger safety has top priority)
- Oil, water and stain repellency
- Durability of oil, water and stain repellency effect after abrasion
- Abrasion resistance of fabric
- Anti pilling
- Antistatic
- Colorfastness to artificial light
- Antistatic
- Dry cleaning fastness
- Washing fastness
- Rubbing fastness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# Enjoy train travel

With growing congestion in major cities around the world and increasing fuel costs, public transportation is fast becoming the transportation means of choice.

To meet this demand and to make public transport more attractive, the industry needs to meet consumer expectations of comfort, cleanliness and safety.

This is where performance furnishing materials play a key role by providing aesthetic appeal whilst at the same time demonstrating durability and safety—especially with fire retardancy.

## Ranking of key functions and effects—functional textiles for trains and coaches:

- **Safety and protection**
  (flame retardant properties)
- **Durability**
  (abrasion resistance, antivandalism)
- **Function and performance**
  (oil, water and stain repellency, antistatic)

Single effects and various effect combinations are possible. Analog to the key requirements of functional textiles used in other means of transportation with different emphasis on each specific function and effect!

## Typical functional textiles in public transportation vehicles:

- Upholstery (seat covers, e.g. velvet pile, flat woven)
- Curtains
- Carpets for trains
- Filters
- Headrests
- Roller blinds and sunshades
- Safety belts (mainly coaches)
- Luggage racks

Safety considerations in more advanced markets are already leading to many public service vehicles being equipped with seat belts. Some observers see this area as eventually being an important new extension to the market for air bag technology.

## Desired and statutory effects for textiles used in public transportation vehicles:

- Flame retardancy including low development of toxic fumes in case of a fire (passenger safety has top priority)
- Oil, water and stain repellency
- Durability of oil, water and stain repellency effect after abrasion
- Abrasion resistance of fabric
- Anti pilling
- Antistatic
- Combination of antimicrobial finish with oil and water repellency
- Light-fastness
- Antivandalism effect (destruction of fabric by sharp objects such as knives or pens) >> selection of special fibers and fiber construction

# Enjoy cruising

The cruise industry is one of the fastest growing segments in tourism—growing by more than 2,100 % since 1970, when an estimated 500,000 people took a cruise. More than 12 million people took a cruise in 2006. Industry estimates are that 500,000 more will cruise in 2007.

The cruise industry's growth is also reflected in its expanding guest capacity. Nearly 40 new ships were built in the 1980s and in the 1990s nearly 80 new ships were launched. By the end of 2007, 88 new ships will have been introduced since 2000.

Modern cruise ships are "swimming luxury hotels", which by their very nature require, especially in the cabins, enormous quantities of textiles. Cruise ships therefore represent an expanding segment for the implementation of functional textiles.

## Ranking of key functions and effects—functional textiles for cruise ships:

- **Safety and protection**
  (flame retardant properties)
- **Function and performance**
  (oil, water and stain repellency, antistatic)
- **Durability**
  (abrasion resistance)

Single effects and various effect combinations are possible. Analog to the key requirements of functional textiles used in other means of transportation with different emphasis on each specific function and effect!

## The list of functional textiles used on board cruise ships demonstrates the potential for this segment:

- Upholstery (seat covers)
- Cushion covers
- Curtains
- Roller blinds, vertical blinds
- Carpets
- Wall coverings
- Tablecloths
- Fabric for chairs, sofas and beds
- Lamp shades
- Fabric for deck chairs
- Awnings and sun shades
- Umbrellas

Although most of the above belong to the home textile family with similar requirements, these functional textiles must provide enhanced performance at all levels for thousands of people.

## Desired and statutory effects for textiles used in cruise ships:

- Flame retardancy including low development of toxic fumes in case of a fire (passenger safety has top priority)
- Oil, water and stain repellency
- Durability of oil, water and stain repellency effect after abrasion
- Abrasion resistance of fabric
- Hydrolysis resistance
- Anti pilling
- Antistatic
- Colorfastness to artificial light
- Light-fastness
- Antistatic
- Dry cleaning fastness
- Perspiration, water and washing fastness
- Sea water fastness
- Rubbing fastness