Global Competitiveness of U.S. Military Textiles Industry

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What are Technical Textiles?

Technical textiles are defined as textile materials and products manufactured primarily for their technical performance and functional properties, rather than their aesthetic or decorative characteristics. End uses include aerospace, industrial, marine, medical, military, safety and transport textiles, and geotextiles.¹ The global market for technical textiles was estimated to have a volume of 16.7 million tons with a value of US$ 92.88 billion in the year 2000 and is expected to grow to a volume of 23.77 million tons with a value of US$ 127 billion by the year 2010.² Firms in this sector generally use nonwoven processes to manufacture or finish these products (NAICS 31323, 31332). Since 1996, both these sectors have shown growth in terms of employment and number of plants³ (see appendix Table 1.).

The market forecasts for technical textiles according to geographical region show that between 2000 and 2005, consumption in Europe and the Americas has grown by only 2.8% per annum. Asia will remain an engine of growth; the consumption in region has increased by 4.1% per annum between 2000 and 2005 and is forecast to increase by 4.6% per annum by 2010⁴ (see appendix Table 2.).

Military Textiles:

Defense and civil defense industries rely heavily on technology. Textiles perform a large number of roles for the military. Fabrics can be tailored for protection against extreme weather conditions (heat, cold, wind, and rain), against ballistic impact, and against nuclear, biological and chemical threats. Textiles can also provide camouflage in the visible spectrum, as well as in ultra-violet and infra-red wavelengths. In addition to the clothing and equipment for the individual soldier, textiles find applications such as parachutes, safety harnesses, ropes and tenting.⁵ All these textile products can be grouped together under a single term: “Military Textiles”. With the end of the Cold War in the nineties, there was a major impact on technical textiles with the “new peace” as there was reduction in the military spending in US.⁶ Still this is a large end-use market comprising a mixture of low value/lo-tech and high value/hi-tech products. This is an area of considerable technical development and potential growth.⁷

Developments in Military Clothing⁸:

Since the Second World War, improvements in fabric technology have led to dramatic changes in clothing worn by soldiers. Today, a greater emphasis is placed on making soldiers more
effective in combat and giving them an edge over the enemy than in the past. Military clothing is no longer viewed as a means of identification and protection against the elements, but is instead considered an integral part of the soldier’s fighting kit. There is a growing awareness of the importance of clothing in enhancing the performance of soldiers and protecting their lives during combat. Such awareness has prompted militaries around the world to step up their research and development efforts in an attempt to create the ideal combat uniform.

Military clothing must perform a broader range of functions than most other types of clothing. Along with protection, key performance features include camouflage, high strength, light weight, moisture management, and temperature control. Other properties, such as ultra-violet protection, may be deemed essential for particular circumstances.

Some of the recent developments in military clothing include progress made in minimizing weight and maximizing wear comfort. DuPont’s Kevlar Impact Control facilitates the manufacture of lighter, more flexible and, more comfortable garments. Militaries are also turning to nanotechnology in an effort to make their armed forces more mobile and better protected from enemy assaults. Through nanotechnology, new personnel camouflage systems can be developed that can change pattern and colors as environment changes. “Chameleonic” camouflage allows the soldier to become a mirror of his surroundings. Other nanotechnological developments include the use of fibers which can stimulate muscles and thereby give soldiers greater strength for lifting or jumping.

Fig.1. Chameleonic camouflage
(Source: http://www.apfn.org/apfn/ho_soldier_Imag47_010621_ss.jpg
http://www.outdoor-textiles.com/image/1p_attach_pic_hunting.jpg)

A soldier may carry more than ten batteries to operate various pieces of equipments. Thus there is a need for a reliable source of battery power that is not heavy to carry. Wearable technology
holds the greatest potential in this area, where materials are made that are capable of converting sunlight and indoor artificial light into direct current electrical power. Development efforts are also underway to make next-to-skin garments from electronic textiles which can determine a soldier’s physiological status including heartbeat, blood pressure, respiration and body temperature.

**General Market overview**

According to the Stockholm International Peace Research Institute (SIPRI), the world military expenditure in 2006 is estimated at $1204 billion in current prices. This represents an increase of 3.5% in real terms since 2005 and of 37% over the 10-year period since 1997. Average spending per capita has increased from $173 in 2005 to $177 in 2006 at constant (2005) prices and exchange rates and to $184 at current prices.

**Best markets for Military Textiles**

*The Asia Pacific region:*

- Between 1988 and 2005, military expenditures in the Asia-Pacific region (encompassing Asia and Oceania) increased by 69%.
- During the same period, military expenditures in South Asia alone increased by 91%. This region includes Afghanistan, Bangladesh, India, Nepal, Pakistan, and Sri Lanka.
- Military expenditures in East Asia, including Brunei, Cambodia, China, Indonesia, Japan, North Korea, South Korea, Laos, Malaysia, Mongolia, Myanmar (Burma), Philippines, Singapore, Taiwan, Thailand, and Vietnam, grew by 71% between 1988 and 2005.
- This market is expected to continue its rapid growth for at least the next several years due to the implementation of force modernization programs and new procurement initiatives in Southeast Asia and Australia.

*The Middle East and North Africa*

- Over the past 10 years, the Middle East/North Africa region has emerged as the world’s largest importer of security and defense equipment.
- Between 1988 and 2005, military expenditures in the Middle East increased by 63%.
North Carolina Textile Companies manufacturing military textiles:

**Glen Raven Inc.**\(^{11}\): Glen Raven supplies the woven fabric used in the following products:

- Boots, OTV/Interceptor Vests, MOLLE Systems (MIL C-43734)
- Canteen Covers, Cots, Field Packs (MIL C-7219)
- Duffel Bags (MIL C-55077A)
- Flags (MIL A-59709)
- Hammocks (MIL C-43128)
- Parkas (MIL 43906)
- Tents (MIL C-44423)

Through tight collaboration with military development engineers and program managers, the company has also been able to create a wide range of military-grade fabrics that provide real tactical improvements in weight, durability, and concealment, as well as enhanced resistance to fading, contamination and degradation.

**Precision Fabrics Group**\(^{12}\): Precision Fabrics manufactures many lightweight synthetic textiles for all branches of the United States Military (see Appendix Table 3).

**3 Tex Inc.**\(^{13}\): 3TEX manufactures state-of-the-art woven 3-Dimensional fiber reinforcements (3WEAVE\(^{®}\)) that demonstrate superior processing, ballistic performance, and damage tolerance in composite armor systems. 3TEX reinforcements are a key element in producing hard faced composite armor that demonstrate superior structural capabilities and light weight.

![Image of 3WEAVE®](http://www.3tex.com/armor.cfm)

**Fig. 2.** 3WEAVE\(^{®}\) for armor systems capable of defeating threats including armor piercing projectiles. **Source:** Official Website, 3 Tex Inc. <http://www.3tex.com/armor.cfm>
Industry Trade events and dates for Military Textiles:


- SOFEX is the only special operations exhibition held in the Middle East/North Africa region and over the past ten years has been acknowledged as the premier event of its type.
- Hundreds of millions of dollars’ worth of contracts were awarded at SOFEX 2004, with the Jordanian Armed Forces alone signing contracts worth more than $111 million.
- For more information, please visit the show’s official website at [http://www.sofex.com.jo](http://www.sofex.com.jo)


- DSA is Asia’s largest defense & security exhibition and its exhibitors include nearly 600 manufacturers of hardware and electronic warfare equipment for land, air, and sea defense, as well as security peripherals for homeland security, etc.
- DSA 2004 attracted over 22,000 trade visitors, including 117 official delegations from 23 countries.
- For more information, please visit the show’s official website at [http://www.dsaexhibition.com](http://www.dsaexhibition.com)

Eurosatory 2008: June 2008, Paris, France

- Eurosatory is the only exhibition in the world dedicated to Land and Land-Air Defense.
- The 2004 show attracted nearly 45,000 visitors, including 124 official delegations from 72 countries and two international organizations (NATO and WEU).
- For more information, please visit the show’s official website at [http://www.eurosatory.com](http://www.eurosatory.com)
Works Cited:


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**APPENDIX**

Table 1. 1996-2006 Employment and Number of Plants in NC's Technical Textile sector

<table>
<thead>
<tr>
<th>NAICS</th>
<th>Number of Plants</th>
<th>Average Annual Employment</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>1996</td>
<td>2006</td>
</tr>
<tr>
<td>Non woven fabric mills</td>
<td>3132</td>
<td>26</td>
</tr>
<tr>
<td>Fabric coating mills</td>
<td>3133</td>
<td>19</td>
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Source: <http://www.soc.duke.edu/NC_GlobalEconomy/textiles/overview.php#trends>

Table 2. World Consumption of Technical Textiles by region, 2000-2010

<table>
<thead>
<tr>
<th>Region</th>
<th>Volume (000 tons)</th>
<th>% shares</th>
<th>Annual average % change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td>5,031</td>
<td>5,777</td>
<td>6,821</td>
</tr>
<tr>
<td>Europe</td>
<td>4,162</td>
<td>4,773</td>
<td>5,577</td>
</tr>
<tr>
<td>Asia b</td>
<td>6,963</td>
<td>8,504</td>
<td>10,645</td>
</tr>
<tr>
<td>ROW</td>
<td>558</td>
<td>628</td>
<td>730</td>
</tr>
<tr>
<td>Total</td>
<td>16,714</td>
<td>19,683</td>
<td>23,774</td>
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a Forecasts. b Including Japan.

# Table 3. Military Specification Cross Reference Table

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<tr>
<th>MIL #</th>
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<th>STYLE#</th>
<th>MIL #</th>
<th>TYPE</th>
<th>STYLE#</th>
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<tr>
<td>GQ- MS-2000</td>
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<td>6339/112 (SIMILAR), 8147/112</td>
<td>44378(GL)</td>
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<td>9167/098</td>
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<td>44121</td>
<td></td>
<td>CR#1315 A &amp; B</td>
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<td></td>
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<td>476 G &amp; H</td>
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<td>58406/076, 75508/076</td>
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<td>19256E</td>
<td></td>
<td>8074/056</td>
<td>498E</td>
<td></td>
<td>66111/090 &amp; 9120/090</td>
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<td>21881C</td>
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<td>7020G</td>
<td>II-</td>
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<td></td>
<td>66200/120 (SIMILAR)</td>
</tr>
</tbody>
</table>

*Source: Official website, Precision Fabrics Group*