Textile Damage Assessment

Purpose
Textile damage assessment may assist to answer various types of questions in the forensic examination of a garment or other fabric products. For example:

- Cuts, tears and seam separations present on articles of clothing may be significant when violence is alleged to have been part of an incident or when an act of mischief is believed to have occurred.
- Cuts or tears may be associated to a type of implement, and even to a particular implement (when fibres on it are indistinguishable to fibres comprising the damaged garment).
- The presence of abrasions, tears or glass-type cuts may assist to localize points of contact on a vehicle in pedestrian hit and run accidents, or inside a vehicle in relation to its driver or passengers.
- The presence of thermal damage on a garment may be significant in an arson case.
- Discoloured areas may be significant on a garment from an individual who is suspected of having done a bleach clean-up of a scene.
- It may be possible to obtain a physical match when comparing two (or more) damaged items from different sources and conclude that they were once part of the same item.

How “recent” the damage is, can also be an issue. When it is reported that damage to an item is “recent” this implies that the item has not been laundered or extensively worn since the damage occurred.

Analysis
Textile damage assessment is performed by a macroscopic examination of the item and typically involves performing damage tests, if possible on the same article being examined or another article of similar construction, sometimes with a submitted implement.

The damage is assessed by general observations relative to the construction and general appearance of the item, and by determination of the characteristics the fabric edges, yarn ends and fibre ends.

Significance
Damage is influenced by a number of different factors, including fabric construction and fibre composition.

Some types of textile damage may occur during normal wear, such as surface abrasions, pilling, broken threads, unravelling, stretching/distortion, and environmental discolouration.

It may be difficult to visualize the details that characterize the damage if it is not recent and/or small or, if the edges are coated with blood or affected by environmental exposure.

Although not quantified, a general assessment of the force required to create textile damage may be possible, based on knowledge of fabric construction and damage tests.
Glossary

**Textile construction:**

*Fabric*
A planar structure consisting of fibres or yarns

*Fibre*
The smallest unit in textile production, which can be natural or man-made (short staple or continuous filament)

*Knitted fabric*
Made by the intermeshing of loops of yarn

*Nonwoven fabric*
Made by bonding or interlocking fibres (as by mechanical, thermal or chemical means)

*Seam*
A line where two or more fabrics are joined together, usually with thread

*Thread*
Yarn used to join/stitch pieces of fabric or sew on buttons

*Woven fabric*
Composed of two sets of yarns (warp and weft) interlaced perpendicularly

*Yarn*
Continuous strand (single ply) of fibres with or without twist, or multiple strands (multiple ply) twisted together, used for thread or fabric construction

**Textile damage assessment:**

*Macroscopic examination*
An unaided visual examination, or low power stereoscopic examination

*Stereoscopic microscopy*
Using a microscope with two separate optical systems, one for each eye, giving a 3-dimensional view of the sample

**Textile damage:**

*Abrasion*
The wearing away of a material by rubbing against another surface in a localized area, which, for a fabric, results in a hole and/or thinning of the fabric, or friction-melting of fibres at the surface of the fabric

*Cut*
A fabric separation with neat edges produced by a sharp-edged implement (e.g. knife, razor blade, scissors)

*Fabric pullout*
The ends of yarns perpendicular to the stitching, have come out of the seam

*Fabric separation*
Damage whereby the integrity of a fabric has been disrupted, leaving a cut or tear

*Penetration cut*
A type of cut with torn yarn(s) at the point of entry created by penetration with a pointed sharp implement
**Pilling**
Accumulation of balls of tangled fibres held to the surface of a fabric, produced by wear & tear and/or rubbing against another surface

**Physical match**
The torn/cut edge characteristics of two pieces of fabric are in continuous complementary agreement with each other

**Puncture**
Damage created by penetration through fabric by a non-cutting implement (e.g. screwdriver, bullet), producing a tear and/or irregular hole, which may or may not result in missing fabric (e.g. as may happen with a damaged bullet)

**Scissor cut**
A type of cut created with a sharp two-bladed implement, often showing steps and nicks

**Seam separation**
An area where the threads joining fabrics together are broken, caused by physical stress exerted in opposing directions

**Seam slippage**
Displacement of the fabric yarn parallel and adjacent to the stitch line

**Slash cut**
A type of cut showing characteristics of having been produced through contact along the surface of a fabric by the sharp edge of an implement (e.g. razor blade), resulting in a cut through the entire layer of the fabric and/or cut surface yarns

**Tear**
A fabric separation with ragged edges, caused by physical stress exerted in opposing directions

**Wear and tear**
Damage caused in the course of use