Firearms leave unique marks on fired bullets and cartridge cases when they are used. When the marks on two bullets or cartridge cases are compared, one can determine whether these have been fired from the same firearm or not. In this way, the relations between different events can be established. Comparing cartridge cases or bullets to match those fired from the same firearm is the time-consuming and meticulous kind of work that requires continuous attention. When the number of evidences to be examined and the archive of evidences are large, then manual comparison becomes virtually impossible. BALİSTİKA® is a project to solve this problem. BALİSTİKA® is capable of matching cartridge-cases & bullets automatically, and providing utmost system performance at all times.

What is BALİSTİKA®?

BALİSTİKA® is a ballistic image analysis and recognition system with the following characteristics:
• high matching performance,
• user friendly,
• scalable,
• capable of extracting and using 3-dimensional data,
• based on a relational database relating bullets, cartridge cases, firearms, incidences and individuals.
Data Acquisition
Whole surface of the cartridge case is imaged at once. 3D surface topography data is extracted from 2D images.

- Cartridge case recording ~ 1,5 minutes
- One groove in bullet (land engraved area) recording ~ 2,5 minutes

Why 3D?
- The visibility of tool marks is highly dependent on illumination,
- 2D images do not necessarily carry the full 3D information, which may be very helpful for matching.

How to obtain 3D?
- TÜBİTAK UZAY has developed its own “3D shape extraction system” based on photometric stereo.

Data Matching (Correlation)
The comparison rankings of Cartridge cases are based on breech face, firing pin, ejector mark, and a combined evaluation.

Data Query and Visualization
- Single or multiple Data Query Units distributed over a network
- Superior image quality
- Capability to use a virtual light over cartridge cases and bullets, based on 3D data
- Virtual comparison microscope interface
- Dual monitoring in the system which allows users to inspect all tabulated data with high quality images at the same time

Database
Relational database, linking bullets, cartridge cases, firearms, incidences and individuals.

BALİSTİKA®

BALİSTİKA® system has been developed by TUBITAK UZAY to serve to expedite the delivery of justice for the Department of Criminal Police Laboratories of Turkish General Directorate of Security. BALİSTİKA® project was initially funded by the Scientific and Technological Research Council of Turkey under the Support Program for Research Projects of Public Institutions. BALİSTİKA® currently being used effectively in several cities of Turkey.

BALİSTİKA® is capable of storing enormous size of 3D data that was obtained from the feature extraction of millions of bullets and cartridge cases, and compares them with very high speed and unprecedented matching performance in a short time.