NUMERICS

SPLIT-X 5.4.7 Release Notes (Jul-2025)

Bugfix: Sphere and structure layers of the warhead design were not displayed correctly in the arena if the warhead was not in the default orientation.

SPLIT-X 5.4.6 Release Notes (Apr-2025)

Bugfix: xImpact, yImpact and angle in the pattern tables in the arena text output weren't calculated correctly.

SPLIT-X 5.4.5 Release Notes (Aug-2024)

Bugfix: Fragments hitting a target part multiple times (e.g. hollow or concave target part) were processed incorrectly.

SPLIT-X 5.4.4 Release Notes (Dec-2022)

Optional output of intermediate variables from natural fragmentation calculation (Analysis -> Control -> Output Intermediate Variables).

SPLIT-X 5.4.3 Release Notes (May-2022)

Bugfix: Projectile selection in the Write Projectile Data File dialog (Postprocessing->Projectile Data File) didn't work correctly.

SPLIT-X 5.4.2 Release Notes (Jun-2021)

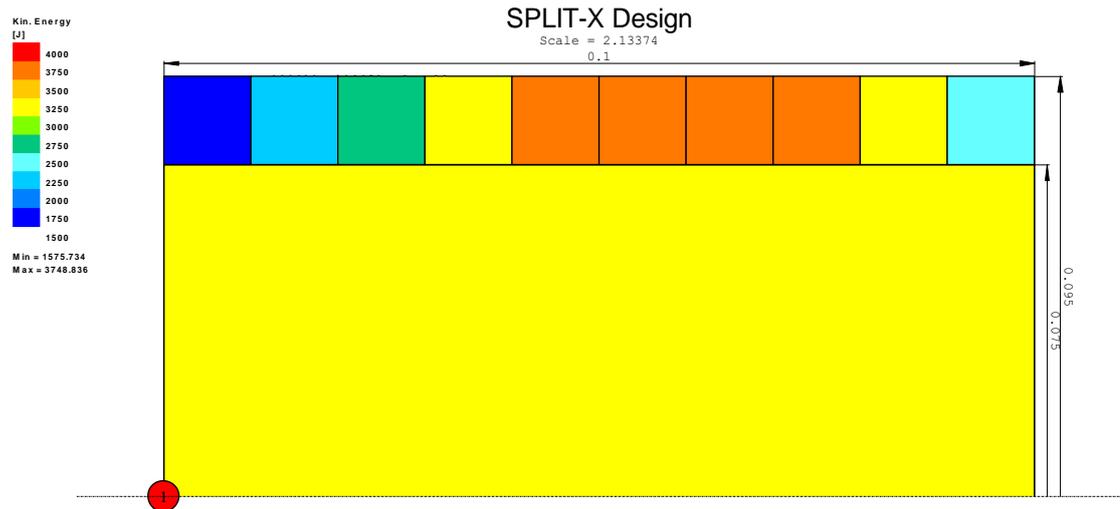Non-public customized version.

SPLIT-X 5.4.1 Release Notes (Jun-2019)

Design
A material legend can be displayed.
Material colors can be changed without modifying the materials in the material database.

Analysis
Fragment layers can be displayed as contour plots of velocity or kinetic energy.

Postprocessing

Creation of mass distribution histograms has been added.

Test Arena

Added new target geometry types: e.g. cylinder, cone, sphere,…

Targets can be placed in cartesian coordinates.

Separate random seeds for fragment orientation and natural fragmentation.

Detailed results of stochastic analysis can be written to a file.

Added new options for fragment orientation:

- minimum penetration
- maximum penetration
- random orientation

Added new view options:

- Show warhead (not only projectiles)
- Trajectory color
- Size of impact points

SPLIT-X 5.3.1 Release Notes (Nov-2014)

Improved Penetration Algorithms

With the implementation of the analytical Extended Walker-Anderson penetration model (XWAM), the drawbacks involved in the application of the empirical THOR equations can now be avoided. Penetration and perforation can be determined with higher accuracy over the whole range of fragment velocities.

SPLIT-X v5.3.1 is delivered with more than 40 material parameter sets for XWAM target materials.

Ejection Angles

A new option allows the user to control the calculation of ejection angles. The menu "Design/Control…" opens the control options dialog. The magnitude of the "Acceleration Time Scaling" factor is 1.0 by default. Higher values result in a wider fragment spray angle. The acceleration time scaling thus provides a possibility to adjust the SPLIT-X model to experimental ejection angles if it should become necessary.
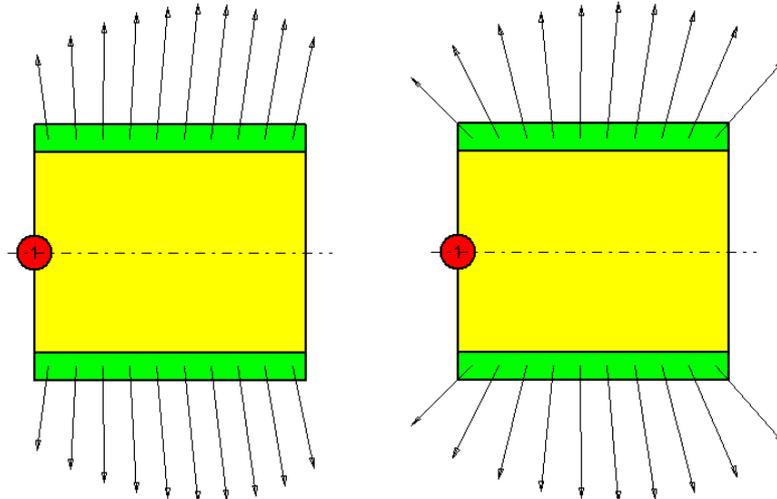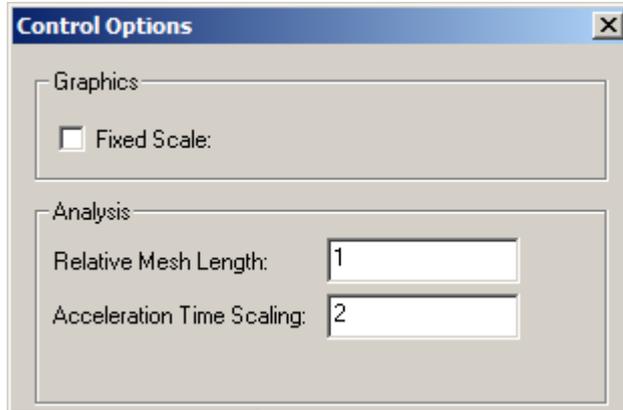

Preformed Fragment Patterns with Gaps

To account for tolerances in fragment size and assembling methods, a gap size between adjacent preformed fragments can be specified in the "Layer"-Dialog.
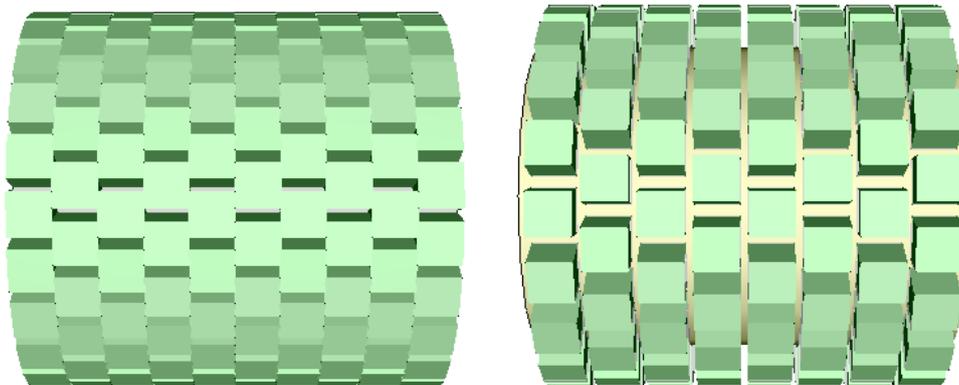
Polar Diagrams

Fragment distributions and fragment characteristics as well as arena test results can now be plotted in polar diagrams.

0 = EnergyPerArea(psi), Test Arena, Steel 4140 (Mott), Natural
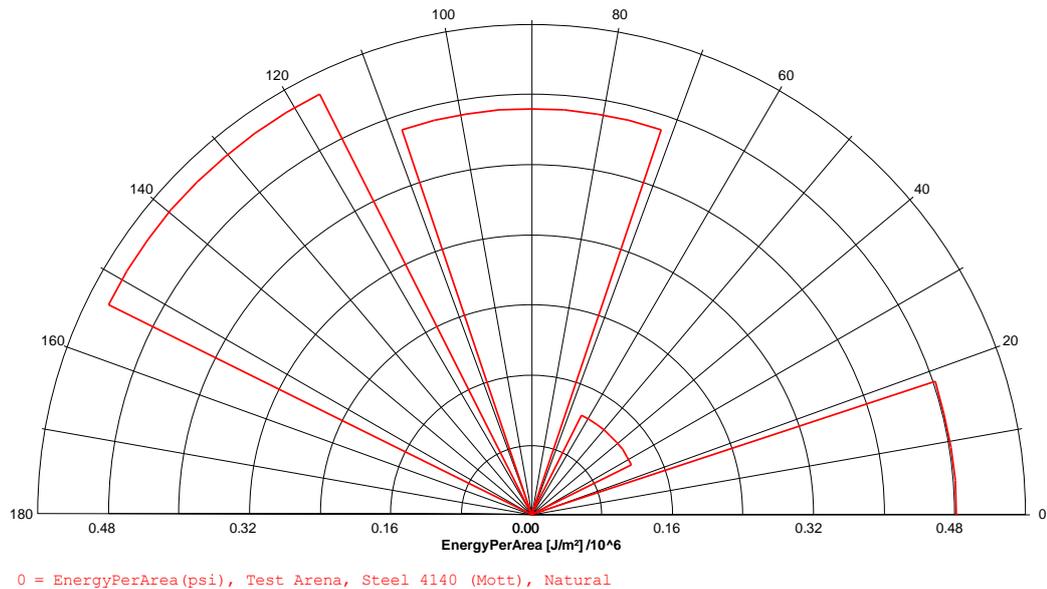
Arena
An advanced arena setup function permits a semi-automatic arena setup. Additionally, the target panels can be moved and rotated interactively in the arena, and the coordinate axes can be displayed in a Cartesian or a Polar system.

SPLIT-X v5.3.1 permits the import of fragment data from fragment data files (.pit) and z-data (.zdata). By this also empirical fragment or manually created data, e.g. for non-axisymmetric warheads, can be analyzed in arena test simulations.

Evaluation of Fragment Energy
Evaluation functions for fragments' kinetic energy have been added to profile and range plots.

SPLIT-X 5.2.16 Release Notes (Nov-2012)

Bugfix: Crash when creating a new specification.

SPLIT-X 5.2.15 Release Notes (Feb-2012)

Minor changes in the demo version.

SPLIT-X 5.2.14 Release Notes (Dec-2011)
Non-public customized version.

SPLIT-X 5.2.13 Release Notes (Nov-2011)

Normal distribution of aspect ratio of natural fragments introduced.

SPLIT-X 5.2.12 Release Notes (Okt-2011)

Fixed a rare crash while analyzing certain warhead designs.

SPLIT-X 5.2.11 Release Notes (Okt-2011)

A new parameter for natural fragmentation materials has been introduced: "Failure Strain". The parameter can be set to zero, then the sole failure criterion is the fracture criterion of Taylor. If a finite value for the failure strain is entered, the casing does not fracture until this failure strain is exceeded.

A tighter tolerance in calculations of the fracture time has been set. In usual natural fragmentation problems this can change the number of fragments by typically 0.1%. For problems with unusual low fragment velocities (some 100 m/s) the changes can be larger.

Fragment materials contain additional parameters (strength and EOS) used for penetration modeling with XWAM.

SPLIT-X 5.2.10 Release Notes (Okt-2010)

Change in the output format of the z-data file: Number of projectiles is not limited to 10 digits anymore.

SPLIT-X 5.2.9 Release Notes (Okt-2009)

Improved implementation of the algorithms for natural fragmentation in ogive layers.

SPLIT-X 5.2.8 Release Notes (Mar-05-2009)

Copy Protection

From 5.2.8 on SPLIT-X runs exclusively with USB dongles. The older parallel dongles are no longer supported.

Windows VISTA

Setup routines and online help have been modified to be compatible with VISTA.

Online Help

HTML-help has replaced the former help format.
Manuals can be opened via the Help menu.

Z-data Files

Fragmentation data can be written to a "z-data file" through the menu
"Postprocessing/Z-data file".

Views

3d graphical output can be rotated, shifted and zoomed by mouse actions:
Alt + left button: Shift
Alt + Ctrl + left button: Rotate
Alt + Shift + left button: Zoom

SPLIT-X 5.2.5 Release Notes (February 2007)

Arena

Output List

The impact pattern for each fragment type and each target panel is listed in the text
output.

Pattern

Columns for residual velocity and residual mass were added to the text output.

Target Definition

It is possible to move panels with the mouse. This makes it easier to understand the
parameters that specify the position of a panel.

SPLIT-X 5.2 Release Notes (February 2006)

Natural Fragmentation

Discretization

By default SPLIT-X uses a discretization twice as long as the average layer
thickness. The user can now specify a smaller or larger value within the layer dialog.
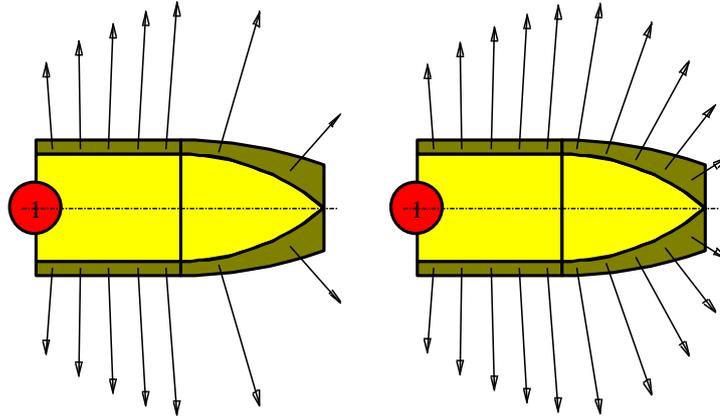
Fracture Mode

The distinction between shear and tension failure was done by SPLIT-X automatically. The user can now specify the fracture mode as a material property.

Analysis and Postprocessing

The average mass and total fragment number is now given in the analysis overview in the output list. For the Payman distribution with certain parameters the fragment number can be infinite and the average mass can be zero.

In the mass distribution dialog several projectile groups can be selected to calculate and display their common mass distribution. In the output list another table is appended that shows the masses within the mass classes as a function of the polar angle.

Controlled Fragmentation

For the fragment type "notched" the pattern option "diamond" is now available. It corresponds to a method of controlled fragmentation promoted by Pearson (J. Pearson, "The Shear-Control Method of Warhead Fragmentation", 4th Int. Symp. Ball., Monterey, 1978).
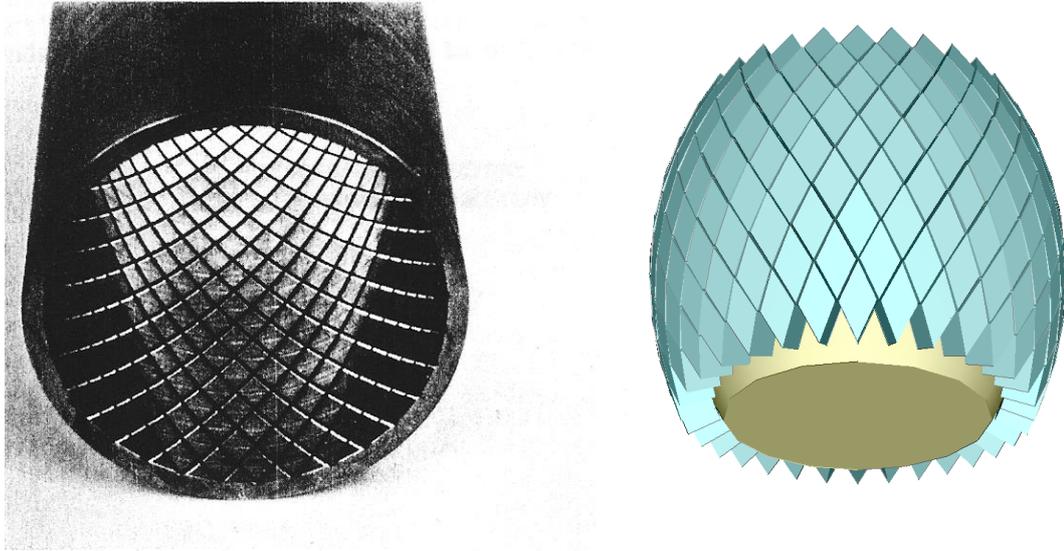
Steel cylinder with diamond pattern grid.

Arena

Hole Size

The output list of a pattern plot gives the hole size for each perforation hole in a target panel. An improved algorithm is now applied. Details may be found in the theory manual.

Parametric Analysis

The position of the warhead and the fuze time can be varied by SPLIT-X. A plot of the number of perforations versus position or time can be generated.
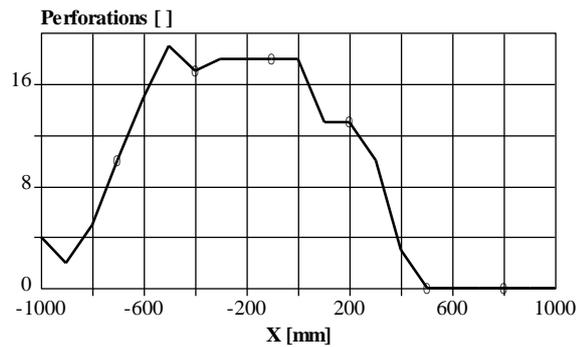
0 = SPLIT-X Design, Armco Iron (Exp), Natural, Test Arena, 1

Stochastic Analysis

A number of trials can be specified by the user. For preformed and controlled fragments the orientation at impact may cause a scatter in the number of perforations. In addition, in the case of natural fragments, the fragment mass is treated as a random variable. The result of the stochastic analysis is given in tabular form in the output list.

```
.......................................................................
 STOCHASTIC ANALYSIS
 10 Trials

 PERFORATIONS
 Panel-No     Average     Std-Dev     Minimum     Maximum
        1        21.0         2.9          17          26
        2         5.5         1.8           2           8

 HITS
 Panel-No     Average     Std-Dev     Minimum     Maximum
        1       137.9        12.9         121         166
        2        12.8         2.4          10          16
.......................................................................
```

Perforation Profile

A perforation profile can be generated for a warhead and a target panel. Results are
analogous to those of the standard postprocessing option. However, the standard
option puts user specified values of distance and impact angle into the drag and
perforation equations. This may be an approximation to real situations, where flight
distances and impact angle can vary. Profiles created from within an arena take into
account real distances and impact angles.
In addition, not only an axial warhead velocity is possible, but a velocity vector plus
a rotation around the axis.

Output

- It is now possible to display only those shotlines, which hit a target.
- A summary of analysis results is appended to the output list.

Optimization

It is now possible to fix the relative position of the detonator.

Postprocessing

Profile plots around the circumference are now available.

Layer Geometry

The construction method used so far unavoidably resulted in inexact geometries
when tapered layers were added to curved sections. In some situations the defect may
be cured by specifying another construction method within the layer dialog.
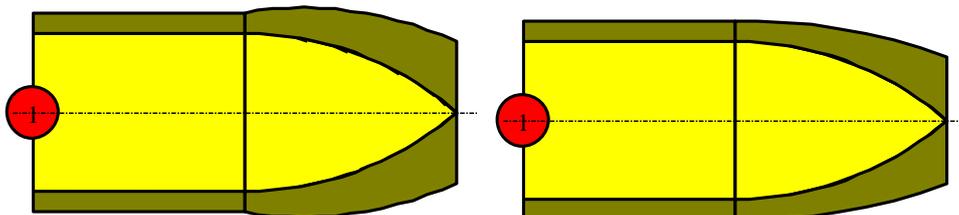
Other Changes

- Materials used in any object loaded from a file are now added temporarily to the database.

- When an output list is exported using the CSV-format the locale list separator is used instead of a semicolon.

Documentation

- The User's Manual has been updated.
- The manual on natural fragmentation has been updated.
- A Theory Manual is available.