

SURVICE

ENGINEERING COMPANY

PENCALC™ — AN ENGINEERING DESKTOP TOOL FOR PENETRATION MECHANICS AND ARMOR EVALUATION

THE PROBLEM

The extent to which munitions can penetrate different types of armors is a fundamental question in the conduct of survivability analysis. As armor materials and configurations continue to proliferate at a rapid pace, the need to rapidly and effectively evaluate their ballistic performance is more pressing than ever.

THE SOLUTION

The SURVICE Engineering Company's PenCalc™ penetration code is a spreadsheet-based implementation of two well-known penetration algorithms: the Project THOR and the Joint Technical Coordinating Group for Munitions Effectiveness (JTCG/ME) equations. PenCalc™ contains an extensive list of target materials and threats from which to choose, is easy to use, and runs quickly. And when combined with SURVICE's expertise in computational numerical analysis, PenCalc™ is easily extended to include new threats and/or armor materials.

THE BENEFITS

With PenCalc™, analysts have the ability to run penetration calculations on their desktop or laptop computers, including the ability to iterate on ranges of threat/target impact conditions, threat characteristics, and target material properties.

In addition, rapid analytical evaluation of armor material ballistic performance reduces test costs by providing the means for relative

comparison of materials and configurations and the evaluation of potential test criteria prior to expensive range time.

PenCalc™ puts at the analyst's fingertips a powerful set of tools for fast, accurate predictions of armor performance vs. an array of fragments and small- to medium-caliber projectiles. And the results of the penetration calculations are provided in an electronic spreadsheet.

APPLICATIONS

EVALUATING NEW ARMOR MATERIALS

SURVICE's expertise in computational penetration mechanics, using finite element and other numerical methods, provides the means to develop the parameters to be used by PenCalc™ for generating ballistic performance estimates on new materials and novel armor configurations prior to evaluation by testing.

SUPPLEMENTING TEST DATA

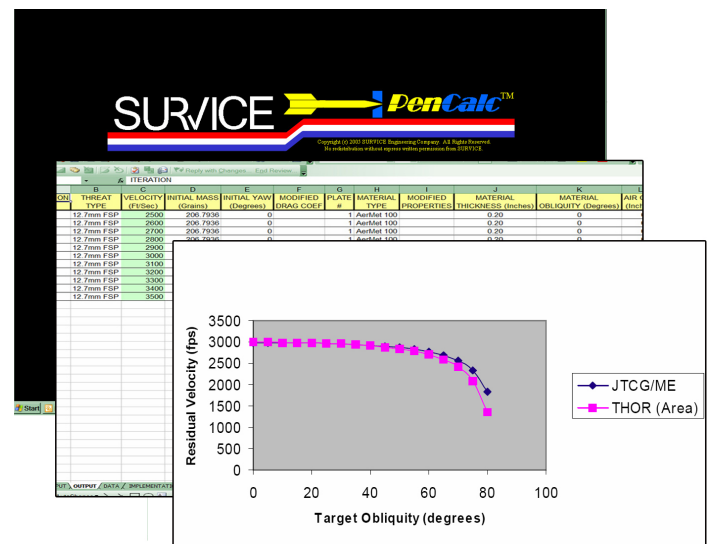
The iteration capability of PenCalc™ allows the analyst to investigate threat/target impact conditions outside the span of test data. Once material properties and penetration constants have been matched to test data (a simple process in

PenCalc™), full ranges of conditions (such as target obliquities, impact velocities, and projectile yaws) can be computed.

EVALUATING NEW THREATS

The PenCalc™ built-in threat list contains a user-defined fragment-simulating projectile, and most small- or medium-caliber kinetic energy threats are easily added. PenCalc™, used in conjunction with SURVICE's subject-matter experts, provides the means to evaluate the efficacy of the JTCG/ME and/or THOR equations for a wide range of applications.

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PenCalc™ Output