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Evaluating the Contributions of Material Control to Insider Protection

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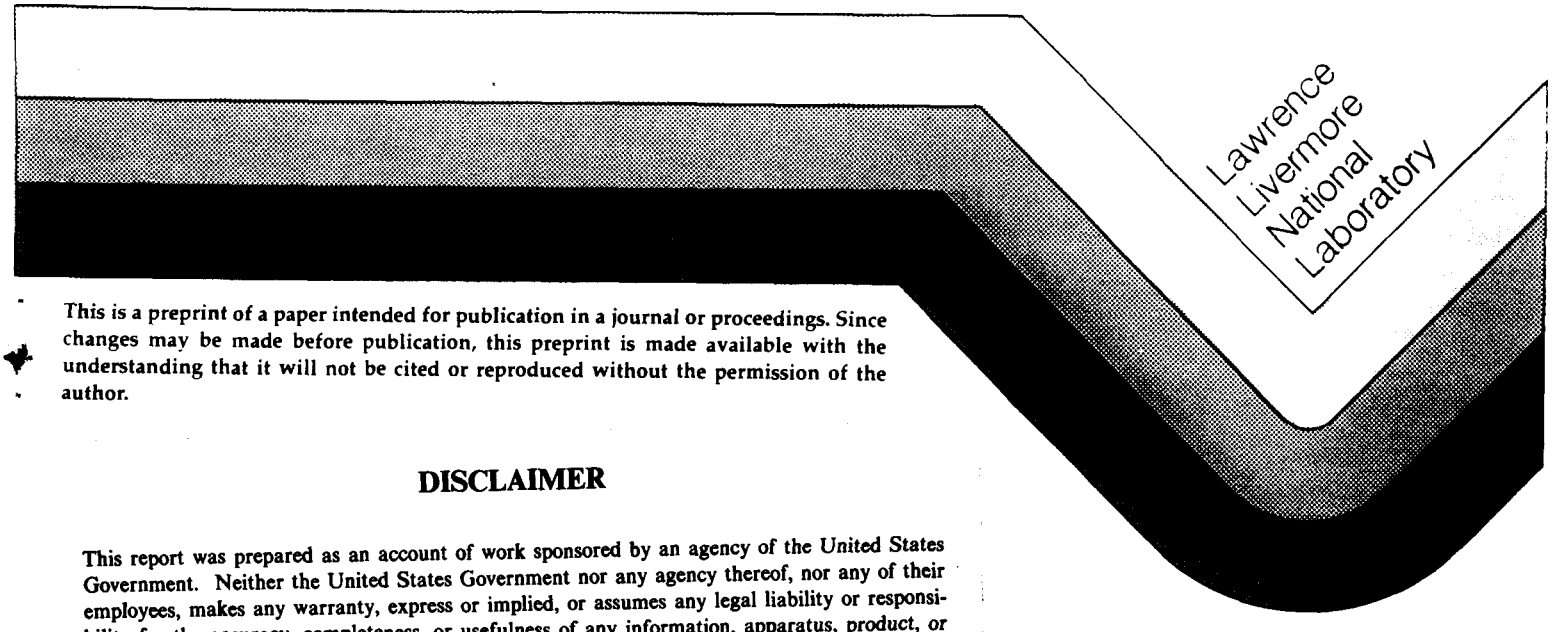

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Evaluating the Contributions of Material Control to Insider Protection

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Introduction

Facilities handling nuclear material must be adequately protected against a spectrum of threats including insiders, outsiders, and collusion among insider and outsider adversaries. To counter these threats, facilities implement an integrated system of physical protection (PP), material control (MC), and material accountability(MA). (Personnel Security Assurance Programs are also used to help deter and detect potential insider adversaries.) Naturally, the contribution of each of these systems to protection against the different threats varies. Material control plays an important role in protecting against the insider threat and in assuring that material is where it should be. Evaluating its contributions, however, to the overall protection is challenging. This paper addresses these challenges, describes approaches we've developed to help assess the adequacy of protection, and demonstrates their use in evaluating the contribution of alternative configurations of MC systems. The paper focuses on one of the modules of the ASSESS code–a state-of-the-art safeguards evaluation tool developed jointly with Sandia National Laboratories–and discusses its use for assessing the contributions of MC to an overall insider protection program and for evaluating the safeguards benefits of new MC technologies.

Challenges in Evaluating MC contributions

Two factors complicate the process of evaluating MC contributions. First,. it is often difficult to separate MC features from those that are traditionally viewed as PP or MA components. For example, while transfer of material is the responsibility of MC, security inspectors are typically

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involved in verifying authorizations and approving the move. Second, while many hardware components are used for controlling and monitoring material, the effectiveness of these components relies heavily on administrative procedures which are difficult to model and to quantify their effectiveness. Moreover, since insiders have the access and authority these procedures can be easily circumvented if not properly designed.

An Overview of ASSESS and Its Use for Evaluating Effectiveness of MC Components

ASSESS is a comprehensive tool for evaluating safeguards effectiveness against insiders, outsiders, and a limited form of collusion among insiders and outsiders. The tool, which runs on an IBM AT or compatibles, consists of six modules including modules for Insider Evaluation, Outsider Evaluation, and Insider/Outsider Handoff Collusion. Currently, ASSESS focuses on MC and PP features only, and plans are under way for incorporating MA components. This paper focuses on the Insider Evaluation Module of ASSESS and the approach used for giving credit to the safeguards contribution of material control measures. For a more general discussion on ASSESS, the reader is referred to Ref. 1.

The Insider Evaluation Module of ASSESS [2] contains the threat definition and a model for assessing the vulnerability against theft or diversion of special nuclear material by nonviolent insiders. These insiders, because of their access and authority to facility safeguards and material, have special opportunities to circumvent physical security and material control features to minimize their probability of detection. The module provides a framework for explicitly accounting for those special characteristics of the insider adversary and for the detailed description of the safeguards hardware and procedures. The Insider Module includes an extensive database of adversary types, predefined lists of access and authority attributes, strategies for defeating safeguards components, and probabilities of detection.

Of special importance here is modelling of MC hardware and procedures and their implementation. For example, the module incorporates special techniques for modelling material control procedures for authorization and transfer of nuclear material. This includes transfer of samples, special nuclear material, and radioactive waste. Currently, other than the transfer procedures, the database includes performance data and defeat methods for presence sensors, flow rate monitors, bar code readers, item verification techniques, and tie-downs.

The module produces an assessment of the probability of detection for each insider adversary type using their best strategies. It also identifies for each adversary class the optimal strategies and the chosen defeat methods. As such, it helps pinpoint areas for potential improvements and for comparing alternative configurations of the system. These capabilities can help assess the benefit of various material control components and help evaluate the trade-off between PP and MC features of a safeguards system. Conceptually, the tool can be extended to help document the safeguards benefit of implementing the new MC technology currently under development prior to its implementation. This technology includes methods being developed for material and personnel tracking and image surveillance systems for item control and holdup determination using IR cameras .

Conclusions

Evaluating the safeguards contribution of material control systems is a challenging task. The Insider Evaluation Module of the ASSESS model and database can be used to help quantify the contribution of MC components and to quantify the trade-off between upgrading MC and PP elements. The database is designed so that it can be easily updated as new technologies are developed or new test results become available. ASSESS version 1.0 is complete, and we anticipate beginning the transfer of this technology to the user community early in FY 90.

References

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2. R. A. Al-Ayat, C. J. Patenaude, and R. A. Saleh, *Technical Documentation of the Insider Evaluation Module of ASSESS*, Draft Report, Lawrence Livermore National Laboratory, Livermore, CA (March 1989)