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A User’s Guide to the Technical Training Schoolhouse Model

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Prior RAND research on AETC’s management of enlisted training identified a lack of analytic tools to assess changes in the pipeline (Manacapilli et al., 2004). That study recommended the development of two models. First, AETC needs a model of an actual schoolhouse system. Second, AETC needs a model of the entire training pipeline, from recruiting to on-the-job training at the operational units. The schoolhouse model grew out of the first recommendation. This document is a user’s guide for the Excel-based front end used to organize and manage the detailed data for the Extend simulation model. (See pp. 1–3.)

AETC manages initial skills training across the Air Force. Broadly speaking, this consists of flying training and technical training across a wide range of career fields. Compared with flying training, technical training is a small training component in terms of dollars spent but huge in terms of the number of people trained. (See pp. 5–7.) Flying training can cost $1 million or more per pilot, but only slightly more than 1,000 pilots per year undergo flying training. Technical training averages just $20,000 per student, but more than 30,000 students receive technical training in initial skills alone. Consequently, understanding and improving the operation of the technical training pipeline can have a significant impact on Air Force costs and on the quality of airmen undertaking their first assignments. (See p. 8.)

We developed the schoolhouse model to assist in the planning and resourcing technical training. The model provides an entity-level simulation of an actual training group and its associated squadrons. The model simulates courses, plans of instruction, flights, instructors, training devices, and classroom facilities. Analysts can use the schoolhouse model to develop estimates of the resource requirements for initial skills training courses. Its uses include

- evaluation of the change in production with increases or decreases in resources (facilities, instructors, and training devices)
- highlighting resource bottlenecks as a result of changes in the plan of instruction
- providing insight into classroom details such as the ratio of empty seats to the average number of individuals who prove ineffective in training
- assessing the change in production resulting from changes in washback and attrition rates. (See pp. 9–12.)

These are only a handful of the many ways in which an analyst can use the model to evaluate initial skill training issues.
The schoolhouse model is composed of two applications. The front end of the model contains a set of Excel worksheets along with Microsoft Visual Basic® programs that control the input and manipulation of the data. The second application is an Extend simulation model of the schoolhouse processes. (See pp. 13–17.)

The model has been purposefully designed to be data-driven. This means that neither the Visual Basic routines nor the Extend model must be rewritten in order to analyze a different context or a different schoolhouse. The data fully define the structure and operation of the schoolhouse. (See pp. 19–46.)

The Excel front end and the Extend model mimic current AETC processes. For example, we use data formats taken directly from AETC databases, manuals, and forms. (See pp. 9–12.) The data are represented in a way that is very similar to actual forms and data formats used by AETC. Additionally, the model follows the processes defined for technical training.

We chose Excel as the front end because of its widespread use and extensive capabilities. It offers a user-friendly interface that can handle a wide variety of data types in one file location. Additionally, the embedded Visual Basic capability allowed us to build routines to convert the data into text files for use in the Extend simulation.

The development of the schoolhouse model has three main strengths over previous methods. First, AETC has little capability to model the technical training process and so any repeatable mathematical tool is a marked increase over the present capability. Second, AETC manages hundreds of different courses. It is not feasible to build a model for every course. As mentioned previously, the schoolhouse model is data-driven: No new coding is required to model a different course. (See pp. 51–52.) Finally, the model produces a detailed history file of every event in the simulation. (See pp. 20, 48–49.) The model need not be rerun to look at other measures or metrics. Instead, the event history file can be reanalyzed with statistical tools. (See pp. 53, 58–59.)

The weakness of the schoolhouse model falls into three areas. (See pp. 51–52.) First, it is time-consuming to build the databases. It can take from one day to one week to gather and input all the data required for a course. The data required to run the model are readily available, although it must be obtained from multiple sources and translated from multiple formats. Future enhancements to the model may include an automated data-building feature. Already, AETC SAS has developed some automated tools to build parts of the database.

The second major weakness is the long run time for analysis. An analysis of changes at a typical wing can require run times of 10 to 20 computer hours. Dual-processor computers or multiple computers can reduce the time required.

The final weakness is the very large size of the event history file. As noted above, this file is extremely useful for analysis. Unfortunately, the file is very large. One two-hour run can easily produce a 100- to 200-MB file. Multiple replications require gigabytes of storage. The entire AETC pipeline may require terabytes of storage.

The schoolhouse model has many applications. It is currently a working model, but it can be enhanced to include additional tools and training options. A next step is to create a user’s group to guide the development and future use of the model. (See pp. 61–62.)