

# **The Patrol Automated Manpower Allocation Model**

## **I. What Is PAMA?**

The North Carolina State Highway Patrol's Patrol Automated Manpower Allocation model (PAMA), is a derivative of the Police Allocation Model (PAM) developed by Northwestern University for Public Safety. PAM was designed for state police agencies, or divisions within those agencies, whose mission includes the delivery of police traffic services. The model is designed to help agencies address two key resource allocation questions: 1) What is the total number of officers (i.e., troopers, field supervisors, and staff and command personnel) that are required to provide an acceptable level of service? AND 2) How should a specified total number of officers be allocated by geographic regions or time periods to maximize agency productivity?

## **II. Assumptions**

All models are limited by the assumptions on which they are built and by the data that are used. Agencies must resist the temptation that this model provides "the answer" since all models use a variety of assumptions about the "real" world to assemble data into rational patterns for decision-makers. Decision-makers must weigh the merits of the model against other factors (e.g., political, economic, operational, etc.).

## **III. Procedures Used In the Model**

The procedures used in PAMA determine the total staff requirements for the delivery of police services based on an analysis of patrol workload requirements, performance objectives, and personnel policies, all measured in time. All trooper time is divided into two categories: patrol and non-patrol. Non-patrol time, determined largely by the personnel policies of the agency, is reflected in the "shift relief factor." Patrol time is divided into four time components: 1) Reactive time (calls for service), 2) Proactive time (self-initiated time), 3) Proactive time (uncommitted patrol time), and 4) Administrative time.

The procedures are designed to determine total staffing requirements for "autonomous patrol areas" (or APAs); that is, geographic areas that exhibit the following characteristics: virtually all calls for service that originate in that area are handled by troopers assigned to that area; troopers assigned to the area are rarely assigned to calls for service outside of their area; although troopers may be assigned to a specific geographic subdivision within the area for patrol, a trooper may be dispatched, if required, to a call for service anywhere within the area. A single APA may be defined as a zone, a district, or even a county.

PAMA can determine the total staff requirement for an entire agency using the following steps: 1) The entire jurisdiction is used as a single APA or is subdivided into a number of APAs that cover the entire jurisdiction but do not overlap one another. 2) PAMA determines the total staffing requirement for each APA. 3) The staffing requirement for the entire jurisdiction is obtained by adding the staffing numbers of all APAs. (The resulting total may need to be supplemented with additional personnel assigned to central or regional headquarters of the agency). The following steps are used to determine the total staffing requirement for individual APA's: 1) Determine the average daily on-duty staff requirement (i.e., the

number of troopers required to meet the administrative, reactive, self-initiated, and uncommitted patrol requirements). The resulting number of troopers is then adjusted for specialized units and, if applicable, minimum staffing requirements. 2) Determine the average number of field supervisors required to support the average daily trooper requirement. The number of troopers is then adjusted to account for patrol workload performed by field supervisors. The total calculated staff requirement will include troopers and field supervisors.

PAMA determines the average number of on-duty troopers that will be required each day (i.e., within each 24-hour period) using a mathematical formula. Values used in the formula are based on the workload level, operational policies, and roadway and traffic characteristics of the agency and patrol area. The initial value for the average number of on-duty troopers required per day is examined to determine whether additional or fewer troopers are needed because of: 1) Patrol provided by troopers assigned to specialized units (e.g., hazardous materials or accident investigations), and 2) Minimum staffing levels.

The average number of on-duty troopers required per day serves as the basis for calculating the number of on-duty field supervisors required. Two factors are used to determine the final number of on-duty troopers and supervisors: 1) The average number of troopers supervised by each field supervisor (set by agency policy), and 2) The fraction of each field supervisor's time spent on patrol (i.e., non-supervisory) activities. The total number of troopers and field supervisors is determined using the shift relief factor for the agency. This factor indicates the average number of officers required to staff one shift position every day, and is based on the shift length, the average work week, and the average number of on-duty patrol hours expected from each officer per year.

The PAMA report for 2012, using an 85% immediate response performance objective for calls for service (considered an acceptable performance objective based on the results of a pilot test of this model), the Highway Patrol is in need of 351 additional troopers and 69 sergeants excluding any consideration for motor carrier personnel. The number of troopers and first line supervisors needed on the Patrol should equal 1,682 members. Yet, the current authorized complement of non-motor carrier troopers and non-motor carrier sergeants is 1,366.

### **III. Limitations of the Model**

There are limitations to PAMA and the model should be viewed as a generic procedure that must be adapted to fit the mission, physical environment, roadway system, and operational idiosyncrasies of each agency. Also, there are a number of issues which, although addressed in a general sense of the PAMA model, represent relationships and circumstances for which additional research operational experience are needed such as 1) the impact of county and municipal law enforcement agencies upon the mission and resource requirements of state agencies; 2) the relationship between the amount of self-initiated work and various roadway and traffic characteristics; 3) the determination of travel time for large non-urban areas with sparse roadway systems; and 4) the determination of staffing requirements for high-volume, high-density, urban interstate and expressway systems.