

AIR TRAFFIC CONTROL FACILITIES

Improving Methods to Determine Staffing Requirements

New TRB Report

NANCY P. HUMPHREY

The appropriate level of staffing for air-traffic control facilities has long been controversial. The Federal Aviation Administration has developed mathematical models, called staffing standards, for estimating its current and future need for controllers. In reports to Congress, the agency maintains that its modeled staffing estimates are defensible in the aggregate for national and regional projections but are less precise for individual facilities. Special Report 250, *Air Traffic Control Facilities: Improving Methods to Determine Staffing Requirements*, documents the outcome of a study to examine the potential for developing methods by which the agency can more confidently determine the required number of controllers at each of its facilities. The study was requested by Congress and funded by FAA.

Nancy P. Humphrey is senior staff officer, Transportation Research Board.

BACKGROUND

The term "staffing standard" is a misnomer because it implies the existence of an external measure of the correctness of the staffing predictions. FAA does not have formal performance criteria or systematically collected measures of air-traffic-control system performance related to staffing against which to compare model-predicted estimates. In the absence of such criteria, predicted staffing is frequently compared with on-board staffing at individual facilities as a measure of the validity of the estimates. The actual staffing level, however, does not necessarily represent the optimal staffing level. Because there is no way at present to test the validity of FAA's staffing estimates, the study committee decided to examine how the staffing standards were constructed and how they are used.

FINDINGS

The study committee reported four major findings. First, FAA headquarters staffing standards do not necessarily provide accurate predictions of staffing requirements at individual facilities because of the



Special Report 250, *Air Traffic Control Facilities: Improving Methods to Determine Staffing Requirements*, is available from the Transportation Research Board (see page 36 for ordering information).

way the staffing standards were developed and are applied. The staffing standards were developed to provide aggregate estimates of staffing requirements at the national and regional levels for the purposes of budgeting and resource allocation. Strategies for sampling, data collection, and model design are geared to the development of national staffing estimates. Furthermore, the process for determining staffing requirements has two steps involving FAA headquarters and the FAA regions; and the staffing standards, as presently used, are only one component of that process. Using the headquarters model-derived, aggregate-staffing estimates as a budget target, the regions develop their own estimates of facility-level staffing requirements to determine the final allocation of manpower to individual facilities.

Second, it is unlikely that the current staffing standards can be modified to provide stand-alone estimates of individual facility-staffing requirements at the level of precision implied in the congressional request. For the most part, the current models reflect simple, empirically observed relationships between controller work and the level of air-traffic activity. They cannot explain the complexity and dynamics of the air-traffic control system because a solid theoretical understanding of the factors that contribute to differences in controller performance is lacking, and measurement data are inadequate.

Although more sophisticated models could be developed, model-driven estimates of staffing requirements are likely to deviate from perceived local staffing needs and actual staffing levels because staffing decisions are not driven exclusively by the staffing requirements. In addition, factors external to the models, such as difficulties in moving controllers to certain locations, are likely to produce discrepancies between modeled estimates and staffing levels at some facilities. Finally, Congress cannot rely on model-based estimates as long as there is no way to validate them.

Third, it would not be prudent at this time to make more than modest investments in refining current staffing standards in an effort to improve facility-level staffing estimates. In the first place, as noted above, there is no valid way to verify such improvements. In the second place, replacement and upgrading of air-traffic control equipment is under way, and in the longer term introduction of advanced technologies and related changes in operational procedures are likely to alter the way controllers work and may even change the theoretically optimal staffing levels. These changes will probably require a major recalibration of current models; they could require an altogether different modeling approach.

Fourth, more credible and widely accepted estimates of facility-level staffing requirements are more likely to be achieved by improving the process for determining staffing requirements than by attempting to focus on the development of improved model-based staffing standards. The committee prefers an approach that does not rely solely on models. Rather, it advocates a process that combines formal modeled predictions with less formal methods reflecting expert judgment regarding staffing requirements at individual facilities.

RECOMMENDED STRATEGY

To improve the current staffing process, the committee recommends a strategy to reconcile formal “top-down” estimates of staffing requirements from FAA headquarters with those generated in FAA regions by a less formal “bottom-up” approach.

First, refine the current staffing standards and consider a new modeling approach in the future, if needed. A quantitative model is a valuable part of the headquarters component of the staffing process. It provides a consistent method for estimating staffing requirements to complement the judgment of experts. Improvements in the current models to enhance their usefulness for initial staffing estimation and for subsequent oversight purposes are desirable, however. Thus FAA should examine the potential for refinements to the current staffing stan-

dards through low-cost pilot studies. In the longer term, if the cost of refinements to the current staffing standards is large or if changes in the air-traffic control system result in major changes in controllers’ work that would render the current models obsolete, consideration should be given to investment in a more sophisticated modeling approach.

Second, develop a uniform regional approach to determining facility-staffing requirements. FAA headquarters, in consultation with the regions and with input from the facilities, should identify and share information on best practices in the individual regions as well as in those of other systems, such as the U.S. armed services. Once consensus is reached on an approach, FAA headquarters should establish it uniformly across the regions and provide training, if needed, on its use.

Third, establish a headquarters-level oversight process to review and reconcile differences between headquarters and regional estimates of staffing requirements at the facility level. The oversight process should reflect the expertise of those involved in making facility-staffing decisions, including FAA regional and facility managers as well as headquarters technical staff. FAA should determine how best to organize this function.

Fourth, develop performance measures for validating facility-staffing estimates. FAA should develop an information system to track the operating and performance characteristics of air-traffic control facilities, building on data already collected by the regions or headquarters. Information based on these data would be provided to the oversight team to assist it in comparing the costs and service implications of different levels of facility staffing, in turn creating the basis for validating facility-staffing estimates.

COMMITTEE TO STUDY FEDERAL AVIATION ADMINISTRATION’S METHODOLOGIES FOR ESTIMATING AIR TRAFFIC CONTROLLER STAFFING STANDARDS

AARON COHEN, *Chairman*, Texas A&M University, College Station
CHARLES B. AALFS, Federal Aviation Administration (retired)
RUSSELL A. BENEL, The MITRE Corporation, McLean, Virginia
GEORGE J. COULURIS, Seagull Technology, Inc., Los Gatos, California
PIUS J. EGBELU, Iowa State University, Ames
JOE D. HINSON, Federal Express, Memphis, Tennessee
PAUL F. HOGAN, The Lewin Group, Fairfax, Virginia
WILLIAM C. HOWELL, American Psychological Association Science
Directorate, Washington, D.C.
DONALD A. KIMBALL, Federal Aviation Administration (retired)
THOMAS M. MCARDLE, SABRE Decision Technologies, Southlake, Texas
NORMAN T. O’MEARA, Logistics Management Institute, McLean, Virginia
PHILIP J. SMITH, The Ohio State University, Columbus
KAY M. STANNEY, University of Central Florida, Orlando