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**United States General Accounting Office**
**Washington, DC 20548**

September 23, 2003

The Honorable James L. Oberstar
Ranking Democratic Member
Committee on Transportation and Infrastructure
U.S. House of Representatives

Subject: *Aviation Safety: Information on FAA's Data on Operational Errors at Air Traffic Control Towers*

A fundamental principle of aviation safety is the need to maintain adequate separation between aircraft and to ensure that aircraft maintain a safe distance from terrain, obstructions, and airspace that is not designated for routine air travel. Air traffic controllers employ separation rules and procedures that define safe separation in the air and on the ground.[1] An operational error occurs when the separation rules and procedures are not followed due to equipment or human error. Data maintained by the Federal Aviation Administration (FAA) indicate that a very small number of operational errors occur in any given year—on average about three operational errors per day occurred in fiscal year 2002. However, some of these occurrences can pose safety risks by directing aircraft onto converging courses and, potentially, midair collisions.

You asked us to provide information on FAA's data on operational errors and whether this data can be used to identify types of air traffic control facilities with greater safety risks. Specifically, you asked us to (1) determine what is known about the reliability and validity[2] of the data that FAA maintains on operational errors and (2) identify whether comparisons of operational errors among air traffic control facilities can be used to determine the facilities' relative safety record.

[1] The Federal Aviation Administration (FAA) has established a separation standard in the en route environment of 5 nautical miles horizontally and either 1,000 or 2,000 feet vertically depending on altitude. In the terminal environment, horizontal separation is generally between 3 and 5 nautical miles depending on the type of aircraft.

[2] Data reliability refers to the accuracy and completeness of data. We define data as reliable when they are (1) complete and (2) accurate. Reliability does not mean that data are error free, but that the data is sufficient for the intended purposes. Validity refers to whether the data actually represent what one thinks is being measured. See U.S. General Accounting Office, *Assessing the Reliability of Computer-Processed Data*, GAO-02-15G (Washington, D.C.: Sept. 2002).

To answer these objectives, we reviewed past GAO studies[3] and reports by the Department of Transportation (DOT) and DOT's Inspector General (IG) that pertain to FAA's data on operational errors and applied standard methodological practices for data reliability, validity, and analysis.[4]

**Data Has Reliability and Validity Limitations**

We identified several potential limitations with FAA's data on operational errors based on our review of issued GAO and DOT reports and application of best methodological practices. First, it is very difficult to determine the completeness of the data. FAA collects data on operational errors from two sources—self-reporting by air traffic controllers and automatic reports of errors detected on the en route portion of a flight. The possibility exists for underreporting by air traffic controllers, since some errors are self-reported and some air traffic controllers may not self-report every incident. Second, due to the way the data are recorded, the severity of many errors cannot be determined or is misleading. Prior to 2001, minor errors, such as establishing a 4.5-mile rather than a 5-mile separation, were counted in the same way as more serious errors, according to DOT.[5] In 2001, DOT began to address this issue by establishing a rating system to identify the severity of, or collision hazard posed by, operational errors. The system uses a 100-point scale to rate and categorize operational errors as high, moderate, or low severity. However, in 2003, DOT's IG reported continuing concerns with FAA's data on operational errors.[6] The IG noted that the new rating system provides misleading information and that FAA needs to modify the system to more accurately identify the most serious operational errors. The DOT IG found that in one instance FAA rated an operational error as moderate that was less than 12 seconds from becoming a midair collision. The IG believed that this operational error should have been rated as high severity. The IG also reported that FAA cannot be sure that air traffic controllers report all operational errors.

**Comparison of Operational Errors Alone Does Not Provide Valid Conclusions About Safety of Air Traffic Control Facilities**

Comparisons of operational errors among types of air traffic control facilities, such as FAA-staffed facilities versus contractor-staffed facilities, cannot be used alone to provide valid conclusions about safety due to three factors that we identified based on standard methodological practices and our understanding of FAA's data. First, such problems as the completeness and specificity of data on operational errors are likely to affect the validity of comparisons among air traffic control facilities because operational errors may not be comparably reported at the types of facilities being compared. For example, as we mentioned above, FAA cannot be sure that all operational errors at either FAA-staffed or

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[3]See, for example, U.S. General Accounting Office, *Air Traffic Control: FAA Enhanced the Controller-in-Charge Program, but More Comprehensive Evaluation Is Needed*, GAO-02-55 (Washington, D.C.: Oct. 31, 2001).

[4]See GAO-02-15G; U.S. General Accounting Office, *Government Auditing Standards*, GAO-03-673G (Washington, D.C.: June 2003); and *GAO Policy and Procedures Manual*, Factors Affecting a Design's Credibility.

[5] U.S. Department of Transportation, *Performance Report Fiscal Year 2000, Performance Plan, Fiscal Year 2002* (Washington, D.C.: April 2001).

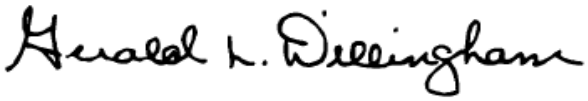
[6] U.S. Department of Transportation, Office of Inspector General, *Top Management Challenges, Department of Transportation*, PT-2003-012 (Washington, D.C.: Jan. 21, 2003) and *Safety, Cost, and Operational Metrics of the Federal Aviation Administration's Visual Flight Rule Towers*, AV-2003-057 (Washington, D.C.: Sept. 4, 2003).

contractor-staffed towers were reported. When such a situation exists, it is difficult, if not impossible, to determine whether the comparative results are valid or are an artifact of under-reporting at one or both types of air traffic control facilities. Second, in order to make valid comparisons a number of factors that might affect the rate of operational errors would need to be accounted for in an analysis. For example, air traffic density, other operating conditions such as the number of flights, age and experience of air traffic controllers, and weather conditions at the time the error occurred all might influence operational errors. These factors would have to be accounted for in any analysis comparing operational errors among different types of facilities in order to determine if the errors are associated with something other than the type of air traffic control facility. Finally, as previously mentioned, a very small number of operational errors occur in any given year (6.7 operational errors per million operations, on average, across all FAA towers in fiscal year 2002), which may make it difficult to detect any real differences in the error rates among facilities.

Because of these factors, the determination of real differences in the rate of operational errors between different types of air traffic control facilities is difficult, and comparisons of operational error rates alone are not sufficient to draw conclusions about the relative safety records of air traffic control facilities. At a minimum, the additional factors mentioned above would need to be considered and analyzed with a technique that models the occurrence of rare events and looks at these events over time. This approach, however, is not without risk and would depend upon the existence of proper and reliable data on operational error rates, operating conditions at the towers at the time the error occurred, and other factors that may be associated with operational errors. Such an approach would allow for a more meaningful comparison of facilities' operational errors through ascertaining and accounting for the multiple factors that may be associated with such errors.

As arranged with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until seven days after the date of this report. At that time, we will send copies of this report to interested congressional committees. The report will also be available on GAO's home page at http://www.gao.gov. If you have any questions about this report, please contact me at (202) 512-2834 or by e-mail at dillinghamg@gao.gov. Key contributors to this assignment are Isidro Gomez, Brandon Haller, Teresa Spisak, and Alwynne Wilbur.

Sincerely yours,



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(540075)

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