

**SAFETY, COST, AND OPERATIONAL  
METRICS OF THE  
FEDERAL AVIATION ADMINISTRATION'S  
VISUAL FLIGHT RULE TOWERS**

*Federal Aviation Administration*

*Report Number: AV-2003-057*

*Date Issued: September 4, 2003*



# Memorandum

**U.S. Department of  
Transportation**

Office of the Secretary  
of Transportation  
Office of Inspector General

Subject: **INFORMATION:** Safety, Cost, and Operational  
Metrics of the Federal Aviation Administration's  
Visual Flight Rule Towers  
Federal Aviation Administration  
AV-2003-057

Date: September 4, 2003

From: Kenneth M. Mead  
Inspector General

Reply to  
Attn. of: JA-10

To: Federal Aviation Administrator

This is our report on safety, cost, and operational metrics of the Federal Aviation Administration's (FAA) visual flight rule (VFR) towers. Our office has been conducting periodic reviews and audits of various aspects of FAA's Contract Tower Program since 1998. Exhibit A provides a synopsis of our reports and the Internet addresses where they can be downloaded.

The objective of this review was to provide an independent analysis of comparable data concerning VFR towers in FAA's Contract Tower Program and VFR towers staffed with FAA controllers. We conducted this analysis as part of our ongoing oversight responsibility of the Contract Tower Program and at the request of the President of the National Air Traffic Controllers Association (NATCA), who asked in a July 30, 2003 letter that we review cost-related issues associated with the Contract Tower Program. Because safety is the primary mission of all air traffic control facilities, we expanded the scope of the analysis to include metrics on safety and operations of contract towers as well. We also analyzed comparable data for 71 FAA-staffed VFR towers.

## **VFR Towers**

VFR towers are air traffic control towers that are not equipped with radar, and air traffic controllers at those towers do not use radar to separate aircraft. Instead, controllers at VFR towers are responsible for sequencing and separating aircraft using other methods such as visually identifying an aircraft's location and communicating with pilots to determine their position.

There are some VFR towers (both in the Contract Tower Program and among the 71 FAA-staffed VFR towers) that are equipped with a monitoring device known as DBRITE (Digital Bright Radar Indicator Tower Equipment).<sup>1</sup> DBRITE is a display system used by controllers to assist them in identifying and monitoring aircraft—it is not a radar system and is not used in the radar control of air traffic.

While many VFR towers handle only general aviation, some VFR towers are busy, complex facilities. For example, some VFR towers in the Contract Tower Program and some of the 71 FAA-staffed VFR towers have regularly scheduled commercial service, conduct 24-hour operations, control military traffic, have runways equipped with instrument landing systems, and are located in busy urban areas.

## **Program Background**

In 1982, FAA began a pilot program to contract for air traffic control services for five Level I towers<sup>2</sup> that were closed as a result of the Professional Air Traffic Controllers Organization strike in 1981. The program grew to 27 towers by 1993. In 1994, Congress provided funding for a multi-year program to convert additional FAA-operated Level I towers to contract operations. The Program was further expanded by including towers at airports that never had an FAA-operated tower.

In fiscal year (FY) 1999, Congress provided funding for a cost-sharing program. This program allows airports that would not normally qualify to be in FAA's Contract Tower Program to enter the Program by paying for a portion of the costs to operate their tower. As of August 2003, there were 219 VFR towers in the Contract Tower Program—195 towers that are fully funded by FAA (full-funded towers) and 24 towers where FAA and the local community share the costs of operating the tower (cost-sharing towers). (See Exhibit B.)

FAA also operates 71 VFR towers that are staffed with controllers employed by the FAA instead of a contractor. (See Exhibit C.) These towers were originally classified as Level II and III facilities, and were not included in the conversion of Level I towers to the Contract Tower Program.

In 1998, FAA reclassified all its FAA-staffed air traffic control (ATC) facilities into ATC grades 3 through 12.<sup>3</sup> Unlike FAA's old classification system, which was based primarily on the number of aircraft operations a facility handled, the new classification system is based on numerous factors. These factors include the

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<sup>1</sup> Some VFR towers are equipped with a similar device known as TARDIS (Terminal Automated Radar Display Information System).

<sup>2</sup> Prior to 1998, FAA categorized all towers as Levels I through V, with Level I towers having the lowest number of operations.

<sup>3</sup> Contract towers are not classified under FAA ATC grade levels.

complexity of operations, the types of users, the configuration of an airport's runways, and the number of aircraft operations handled. The higher the ATC grade, the more difficult the operations and the higher the controllers' average salaries.

The FAA-staffed VFR towers are classified as ATC grade levels 5 through 9. An ATC grade level 5, for example, might handle 20 to 40 aircraft per hour whereas an ATC grade level 9 might handle 80 to 100 aircraft per hour. In comparison, over half of the towers in the Contract Tower Program (reporting air traffic density) handle less than 20 aircraft per hour. However, there are 74 contract towers that handle between 20 and 40 aircraft per hour as well. Those 74 towers are, in our opinion, comparable in terms of operations to the 30 FAA-staffed VFR towers in ATC grade levels 5 and 6.

### ***ATC Grades of 71 FAA-STAFFED VFR TOWERS***

ATC GRADE LEVEL	NUMBER OF TOWERS
5	7
6	23
7	32
8	5
9	4
<b>TOTAL</b>	<b>71</b>

## **RESULTS IN BRIEF**

Overall, the metrics illustrate several important factors in terms of safety and costs of FAA's contract VFR towers and the 71 FAA-staffed VFR towers. (Further details regarding metrics on safety and costs, as well as additional metrics concerning operations and staffing are discussed under the "observations" section of this report.)

### **Safety**

- ✓ In terms of safety of operations as measured by operational errors/deviations (OEs/ODs),<sup>4</sup> both the contract VFR towers and the FAA-staffed VFR towers fell well below FAA's FY 2002 overall average of 6.70 operational errors for every 1 million operations handled.

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<sup>4</sup> An operational error occurs when an air traffic controller does not maintain minimum FAA separation requirements between aircraft. An operational deviation occurs when a controller allows an aircraft to enter airspace managed by another controller without prior coordination and approval.

- In FY 2002, contract towers had 8 operational errors/deviations, which was a rate of 0.49 incidents per million operations handled.
  - The 71 FAA-staffed VFR towers had 38 operational errors/deviations, which was a rate of 2.70 incidents per million operations handled.
  - The FAA-staffed VFR towers in ATC grade levels 5 and 6 (those that are most comparable to contract towers) had 9 operational errors/deviations, which was a rate of 2.03 incidents per million operations handled.
- ✓ While the operational error rates at contract towers and the FAA-staffed VFR towers are significantly better than FAA’s agencywide average, it is important to note that neither the FAA contract towers nor the FAA-staffed VFR towers have a system for automatically reporting operational errors.<sup>5</sup> Although FAA actively encourages self-reporting and has taken adverse action against personnel who intentionally cover up operational errors, FAA cannot be sure that all operational errors are reported at either FAA-staffed VFR towers or at contract towers.
- ✓ It is also important to note that the severity of most of the errors that occurred could not be determined using FAA’s rating system for operational errors. This is because the severity system can only be used for airborne errors that were being tracked with radar.
- ✓ The largest percentages of operational errors/deviations did not occur at the busiest facilities. For example,
- In FY 2002, nearly 80 percent of the operational errors/deviations at the FAA-staffed VFR towers occurred at facilities that average less than 60 aircraft operations per hour.
  - At the contract towers, 75 percent of the operational errors/deviations in FY 2002 occurred at facilities that average less than 40 aircraft operations per hour. Exhibit E lists the specific facilities that had an operational error or deviation in FY 2002 and FY 2001.

## Costs

- ✓ In FY 2002, the average cost to operate the 189 full-funded FAA contract VFR towers was \$365,608, while the average cost to operate the 71 FAA-staffed VFR towers was \$1,741,935.
- ✓ To determine the average cost differences between *comparable* towers in both groups, we compared the FY 2002 costs of 12 contract towers with 12 FAA-

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<sup>5</sup> In contrast, en route facilities, which handle the en route portion of a flight, have a system for automatically reporting operational errors.

- staffed VFR towers in FAA ATC grade levels 5 and 6 that had similar levels of average hourly aircraft operations (air traffic density).
- Our analysis showed that the 12 contract towers, on average, cost about \$917,000 less to operate annually than the 12 FAA-staffed VFR towers, even though they had comparable levels of aircraft operations.
  - ✓ The difference in costs is primarily due to two reasons:
    - FAA-staffed towers are historically staffed with more controllers than contract towers, and
    - FAA-employed controllers generally have higher salaries than contract tower controllers.
  - ✓ In 1999, FAA did the same analysis using FY 1998 cost data and the same towers we selected. At that time, the 12 contract towers, on average, cost about \$787,000 less to operate than the 12 FAA-staffed VFR towers.
  - ✓ A comparison of FAA's analysis of FY 1998 data and our analysis of FY 2002 data shows that the spread between the two groups has increased by about \$130,000 or 16 percent. That increase is primarily a result of increases in salaries for FAA controllers due to a new pay system implemented in FY 1998, combined with the fact that the FAA-staffed VFR towers are generally staffed with more controllers.
  - ✓ In terms of total costs for contract towers and FAA-staffed VFR towers during the period FY 2000 through FY 2002:
    - The costs to operate the full-funded contract towers increased 24.3 percent (from \$55.6 million to \$69.1 million), while the number of towers increased by 16 percent (from 163 to 189).<sup>6</sup>
    - For the same period, the costs to operate the 71 FAA-staffed VFR towers increased 16.7 percent (from \$106.0 million to \$123.7 million), while the number of towers remained constant.<sup>7</sup>
  - ✓ Our analysis of the cost difference between contract towers and comparable FAA-staffed VFR towers indicates that if the 189 full-funded contract towers had been staffed with FAA controllers in FY 2002, the agency's annual operating costs could have been about \$173 million higher (\$917,000 x 189 towers).

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<sup>6</sup> Source: FAA Contract Tower Program Branch.

<sup>7</sup> Source: FAA Air Traffic Resource Management.

## **OBSERVATIONS**

### **Operations**

In FY 2002, contract towers handled approximately 16.4 million operations, while the FAA-staffed VFR towers handled approximately 14.1 million operations. However, unlike most contract towers which are relatively similar (primarily low activity airports), the 71 FAA-staffed VFR towers are not a homogeneous group. The 71 FAA-staffed VFR towers have significant differences in the volume of air traffic they control, the number and types of users they serve, and the complexity of the airspace they manage.

For example, the average number of aircraft operations handled each hour (or average hourly air traffic density) at the 71 FAA-staffed VFR towers ranges from about 20 aircraft per hour to over 100 aircraft per hour. The Van Nuys, California, VFR tower (which is an ATC grade level 9) is the eighth busiest air traffic control tower in the country. In fact, as illustrated in Exhibit C, 11 of the 71 FAA-staffed VFR towers are among FAA's 50 busiest air traffic control towers in the United States in terms of airport operations.

In contrast, of the VFR towers in the Contract Tower Program that reported air traffic density, 102 (more than half) handle less than 20 aircraft operations per hour (on average). (See Exhibit D.)

Although there are significant differences between many of the contract towers and the FAA-staffed VFR towers, there are towers in both groups with comparable operations. For example, 30 of the FAA-staffed VFR towers (primarily ATC grade 5 and 6 facilities) handle between 20 and 40 aircraft per hour. That compares to 74 contract towers that handle between 20 and 40 aircraft per hour as well. (See Exhibit D.)

### **Safety**

In terms of safety of operations as measured by operational errors/deviations, both the contract towers and the FAA-staffed VFR towers fell well below FAA's FY 2002 overall average of 6.70 operational errors for every 1 million operations handled.

In FY 2002, contract towers had 8 operational errors/deviations, which was a rate of 0.49 incidents per million operations handled. The 71 FAA-staffed VFR towers had 38 operational errors/deviations, which was a rate of 2.70 incidents per million operations handled. The FAA-staffed VFR towers in ATC grade levels 5 and 6 (those towers that are most comparable to contract towers) had 9 operational

errors/deviations, which was a rate of 2.03 incidents per million operations handled.

While the operational error rates at contract towers and the FAA-staffed VFR towers are significantly better than FAA's agencywide average, it is important to note that neither the FAA contract towers nor the FAA-staffed VFR towers have a system for automatically reporting operational errors.<sup>8</sup> Although FAA actively encourages self-reporting and has taken adverse action against personnel who intentionally cover up operational errors, FAA cannot be sure that all operational errors are reported at either FAA-staffed VFR towers or contract towers.

It is also important to note that the severity of most of the errors that occurred could not be determined using FAA's rating system for operational errors because the severity system can only be used for airborne errors that were being tracked by radar.

Additionally, the largest percentages of operational errors/deviations did not occur at the busiest facilities. For example, in FY 2002, nearly 80 percent of the operational errors/deviations at the FAA-staffed VFR towers occurred at facilities that averaged less than 60 aircraft operations per hour.

At the contract towers, 75 percent of the operational errors/deviations in FY 2002 occurred at facilities that averaged less than 40 aircraft operations per hour. Exhibit E lists the specific facilities that had an operational error or deviation in FY 2002 and FY 2001.

## **Staffing**

In general, contract towers are staffed with fewer controllers than FAA-staffed VFR towers. For example, our analysis of June 2003 staffing data found that 196 FAA contract towers, on average, are staffed with six controllers. In comparison, the 30 FAA-staffed VFR towers that are most comparable to contract towers (those in ATC grades 5 and 6) are staffed, on average, with 10 and 12 controllers, respectively.

One reason for the difference in staffing levels that we observed during our FY 2000 audit was that, at FAA contract towers we visited, tower managers worked some operational shifts as controllers. In contrast, at the FAA-staffed VFR towers we visited, most tower managers did not work operational shifts controlling traffic.

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<sup>8</sup> In contrast, en route facilities, which handle the en route portion of a flight, have a system for automatically reporting operational errors.



Another reason for the staffing differences, according to officials from NATCA, is that many of the 71 FAA-staffed VFR towers have historically been used as a training ground for new FAA controllers. According to officials from the American Association of Airport Executives, most controllers at contract towers are retired military controllers or former FAA controllers.

Our previous audit work also identified several staffing issues at FAA contract towers that have subsequently been corrected.

- In our FY 1998 audit, we found that not all contract towers were staffed according to contract staffing plans. We recommended that FAA direct contractors to staff contract towers in accordance with contract requirements and establish procedures to periodically review staffing levels at contract towers.
- FAA agreed with our recommendations and took appropriate actions including requiring that staffing at contract towers be a “special emphasis” item during tower evaluations conducted by FAA’s Evaluations Branch. FAA’s Evaluations Branch conducts facility reviews of all FAA air traffic facilities including contract towers and the 71 FAA-staffed VFR towers.
- We also recommended that FAA recover payments of \$2.4 million made to one contractor who did not comply with staffing plans at 35 locations. The amount was never subsequently recovered based on opinions by FAA procurement officials and FAA Chief Counsel that the old contracts were written as fixed price contracts and therefore not subject to recoveries based on staffing differences.
- FAA corrected the contract problem in FY 2000 when it issued new contracts. Those contracts contain specific provisions requiring contractors to report monthly the number of controllers at each location and the hours they worked. The contracts also contain provisions that allow FAA to make downward or upward price adjustments based on actual staffing levels provided by the contractors.
- During our FY 2000 audit, we also tested payroll records for a 2-month period at 37 contract towers and found that contractors (in total) provided the required number of employees and hours within 2 percent of the contractual requirements.

## Costs

In FY 2002, the cost to operate the 71 FAA-operated VFR towers was \$123.7 million<sup>9</sup> compared to \$73.5 million<sup>10</sup> to operate the 219 contract towers.<sup>11</sup> The difference in costs is primarily due to differences in controller staffing levels between the FAA-staffed towers and the contract towers, and the higher salaries paid to the FAA-employed controllers.

We also compared the total and average costs of full-funded contract towers and FAA-staffed VFR towers for the period FY 2000 through FY 2002. (See Exhibit F.) Our analysis showed:

- Between the beginning of FY 2000 and the end of FY 2002, the number of full-funded contract towers increased from 163 to 189 (16 percent) while the total costs for those towers increased from \$55.6 million to \$69.1 million (24.3 percent). The cost increase was primarily due to the increase in the number of full-funded towers and increases in contract costs. Other reasons for the cost increase include a 3-percent wage escalation clause included in the contract, wage determination increases for contract controllers issued yearly by the Department of Labor, and increased liability insurance costs since September 11, 2001.
- Between the beginning of FY 2000 and the end of FY 2002, the number of FAA-staffed VFR towers remained constant at 71, while the total costs for those towers increased from \$106.0 million to \$123.7 million (16.7 percent). The cost increase was primarily the result of increases in personnel compensation and benefits.

In FY 2002, the average cost to operate a full-funded contract VFR tower was \$365,608, while the average cost to operate an FAA-staffed VFR tower was \$1,741,935. Those figures represent average costs for *all* towers in both groups. To determine the average cost differences between comparable contract towers and FAA-staffed VFR towers, we compared the FY 2002 costs of 12 contract towers with 12 FAA-staffed VFR towers in ATC grade levels 5 and 6 that had similar averages for hourly aircraft operations (air traffic density). (See Exhibit G.)

Our analysis showed that the 12 contract towers, on average, cost about \$917,000 less to operate annually than the 12 FAA-staffed VFR towers, even though they had comparable levels of aircraft operations. To put that cost

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<sup>9</sup> Includes \$123.5 million for personnel compensation and benefits and \$0.2 million for other costs.

<sup>10</sup> Includes \$70 million obligated for ATC services, \$3.3 million obligated for insurance, and \$0.2 million obligated for travel and contract support.

<sup>11</sup> Costs are for operating the towers and do not include capital equipment costs, which are paid by FAA and/or the airport.

difference in perspective, if the 189 full-funded contract towers had been staffed with FAA controllers in FY 2002, the agency's annual operating costs could have been about \$173 million higher.

In 1999, FAA did the same analysis using FY 1998 cost data and the same towers we selected. At that time, the 12 contract towers, on average, cost about \$787,000 less to operate than the 12 FAA-staffed VFR towers. A comparison of FAA's analysis of the FY 1998 data and our analysis of the FY 2002 data shows that the spread between the two groups has increased by about \$130,000 or about 16 percent. That increase is primarily a result of higher salaries for FAA controllers due to a new pay system for controllers implemented in FY 1998, combined with the fact that FAA-staffed towers are generally staffed with more controllers than contract towers.

If you have any questions or need further information, please contact me at (202) 366-1959 or David A. Dobbs, Assistant Inspector General for Aviation Audits, at (202) 366-0500.

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## EXHIBIT A. PRIOR OIG REPORTS

- In 1998, we conducted a comprehensive review of the Contract Tower Program and found little difference in the quality or safety of services provided at Level I towers whether they were operated by FAA or by contractors. Specifically, we found that contract controllers met qualification requirements and received required training, users were satisfied with the services they received at contract locations, and the number and types of incidents (such as operational errors and deviations) at FAA and contract towers were comparable.

We also found that contract towers reduced operating costs. However, we found that not all contract towers were staffed according to contract staffing plans. (In our FY 2000 audit, we found those staffing issues had been resolved.) We recommended that FAA direct contractors to staff contract towers in accordance with contract requirements and establish procedures to periodically review staffing levels at contract towers. Those measures were necessary because contract towers were staffed with fewer controllers than FAA-staffed VFR towers and staffing levels were based on contractor-prepared staffing plans. [http://www.oig.dot.gov/item\\_details.php?item=305](http://www.oig.dot.gov/item_details.php?item=305)

- In FY 1999, Congress requested that we conduct a review of an FAA study of expanding the Contract Tower Program to 71 FAA-staffed VFR towers. In that review, we found that contract towers continued to provide services that are comparable to the quality and safety of FAA-operated towers, and that users remained supportive of the Program. We also found that previously reported staffing issues had been addressed. We tested payroll records for a 2-month period at 37 contract towers and found that contractors (in total) provided the required number of employees and hours within 2 percent of the contractual requirements. In addition, we found that FAA's new contract solicitation contained specific provisions requiring contractors to report and certify monthly the number of controllers at each location and the hours they worked.

However, we found that FAA's study of expanding the Program did not fully consider several key factors that needed to be further analyzed and reported to Congress. Those factors included devising a better methodology for determining which FAA-staffed VFR towers could be contracted out, revising estimated savings by location, and evaluating the benefits that FAA controllers from locations converted to contract operations could provide in meeting FAA's projected staffing needs. FAA has not completed actions to address our recommendations. [http://www.oig.dot.gov/show\\_pdf.php?id=95](http://www.oig.dot.gov/show_pdf.php?id=95)

## EXHIBIT B. FAA CONTRACT VISUAL FLIGHT RULE TOWERS (AS OF AUGUST 2003)

### Full-Funded Towers

AK	Kodiak	FL	Melbourne
AK	Bethel	FL	Opa Locka
AK	Kenai Municipal (Mun.)	FL	Panama City/Bay Co.
AL	Brookley (Mobile)	FL	Pompano Beach
AL	Dothan	FL	St. Augustine
AL	Tuscaloosa Mun.	FL	Albert Whitted (St. Petersburg)
AR	Fayetteville	FL	Stuart/Witham
AR	Texarkana Mun./Webb Field	FL	Titusville/Cocoa
AR	Northwest Arkansas Regional	FL	Cecil Field
AZ	Chandler	GA	SW Georgia/Albany-Dougherty
AZ	Flagstaff Pulliam	GA	Athens Mun.
AZ	Glendale	GA	Fulton County
AZ	Goodyear (Phoenix)	GA	Gwinnett County
AZ	Mesa/Williams Gateway	GA	McCollum
AZ	Ryan (Tucson)	GA	Valdosta Regional
CA	Chico	Guam	Agana
CA	Fullerton	HI	Kalaeloa
CA	Hawthorne	HI	Kona/Keahole
CA	Mather (Sacramento)	HI	Lihue
CA	Modesto	HI	Molokai
CA	Oxnard	IA	Dubuque
CA	Palmdale	ID	Idaho Falls
CA	Riverside	ID	Lewiston-Nez Perce Co.
CA	Redding Mun.	ID	Pocatello Mun.
CA	Sacramento Exec.	ID	Friedman Memorial (Hailey)
CA	San Luis Obispo	IL	St. Louis Regional
CA	Brown Field (San Diego)	IL	Bloomington/Normal
CA	Santa Maria	IL	Decatur
CA	Salinas Mun.	IL	So. Illinois/Carbondale
CA	San Carlos	IL	Williamson County (Marion)
CA	Vandenberg	IL	Waukegan Regional
CA	Victorville	IN	Gary Regional
CA	Whiteman (Los Angeles)	KS	Forbes Field (Topeka)
CA	William J. Fox (Lancaster)	KS	Hutchinson Mun.
CO	Eagle County	KS	Johnson Co. Exec.
CO	Grand Junction	KS	Salina Mun.
CT	Bridgeport	KS	New Century Air Center (Olathe)
CT	Danbury	KS	Philip Billard Mun. (Topeka)
CT	New London (Groton)	KY	Owensboro/Daviess Co.
CT	Brainard (Hartford)	KY	Barkley Regional (Paducah)
CT	Tweed-New Haven	LA	Alexandria
CT	Waterbury/Oxford	LA	Acadiana Regional
FL	Naples	LA	Chennault
FL	Boca Raton	LA	Houma
FL	Craig (Jacksonville)	LA	Shreveport Downtown
FL	Key West	MA	Barnes Mun.
FL	Page Field	MA	Beverly
FL	Gainesville	MA	New Bedford
FL	Hollywood	MA	Hyannis
FL	Kissimmee	MA	Lawrence
FL	Lakeland Mun.	MA	Martha's Vineyard

## Full-Funded Towers (continued)

MA	Worcester
MA	Norwood
MD	Washington Co. (Hagerstown)
MD	Martin State (Baltimore)
MD	Salisbury-Wicomico
MI	Battle Creek
MI	Detroit City
MI	Jackson
MI	Sawyer
MN	Anoka (Minneapolis)
MO	Columbia
MO	Joplin Regional
MO	Rosecrans Memorial (St. Joseph)
MP	Saipan International (Int'l.)
MS	Greenville Mun.
MS	Hawkins Field (Jackson)
MS	Meridian/Key Field
MS	Tupelo Regional
MT	Gallatin Field (Bozeman)
MT	Kalispell
MT	Missoula
NC	New Bern
NC	Smith Reynolds (Winston-Salem)
ND	Minot
NH	Boire Field (Nashua)
NJ	Trenton
NM	Farmington Mun.
NM	Lea County/Hobbs
NM	Sante Fe Co. Mun.
NV	Henderson (Las Vegas)
NY	Niagara Falls
NY	Tompkins County
NY	Stewart
OH	Burke Lakefront (Cleveland)
OH	Cuyahoga County (Cleveland)
OH	Lunken Mun. (Cincinnati)
OH	Bolton Field (Columbus)
OH	Ohio State University
OK	Ardmore Mun.
OK	Lawton Mun.
OK	University of Oklahoma/ Westheimer
OK	Wiley Post
OK	Enid Woodring Mun.
OR	Klamath Falls
OR	Medford
OR	Pendleton
OR	Redmond
OR	McNary Field (Salem)
OR	Troutdale (Portland)
PA	Capital City (Harrisburg)
PA	Lancaster
PR	Isla Grande
SC	Greenville Downtown
SD	Rapid City Regional
TN	Smyrna
TN	Millington
TX	Brownsville Int'l.
TX	Easterwood
TX	Waco
TX	Grand Prairie
TX	Rio Grande Valley (Harlingen)
TX	Laredo Int'l.
TX	McAllen
TX	Redbird
TX	Sugar Land
TX	San Angelo
TX	Stinson Mun.
TX	McKinney Mun.
TX	Tyler
UT	Ogden-Hinckley
V.I.	Henry E. Rohlsen (St. Croix)
VA	Charlottesville-Albemarle
VA	Lynchburg
WA	Bellingham Int'l
WA	Olympia
WA	Renton
WA	Felts Field (Spokane)
WA	Tacoma Narrows
WA	Yakima
WI	Appleton
WI	Central Wisconsin
WI	Kenosha Mun.
WI	Rock County (Janesville)
WI	Lacrosse
WI	Timmerman (Milwaukee)
WI	Wittman Regional (Oshkosh)
WI	Waukesha County Airport
WV	Wheeling Ohio Co.
WV	Greenbrier Valley
WV	Morgantown
WV	Parkersburg
WY	Cheyenne
WY	Jackson Hole
<b>Subtotal 195</b>	

## Cost-Sharing Towers

AK	King Salmon
AR	Springdale
AZ	Laughlin/Bullhead City
CA	South Lake Tahoe
GA	Macon
IN	Columbus Mun.
IN	Bloomington
IN	Muncie/Delaware County
KS	Garden City
KS	Manhattan
MO	Jefferson City
NC	Hickory Regional
NC	Kinston

NC	Concord
NE	Central Neb. (Grand Island)
NH	Lebanon Mun.
NV	Elko
NY	Oneida County
OK	Stillwater
PA	Williamsport/Lycoming Co.
PA	Latrobe.
SC	Grand Strand/Myrtle Beach
TN	McKeller-Sipes (Jackson)
WA	Walla Walla Regional
<b>Subtotal 24</b>	

*Source: FAA Contract Tower Program Office*

## EXHIBIT C. FAA-STAFFED 71 VISUAL FLIGHT RULE TOWERS (AS OF MAY 2003)

### ATC Level 5 VFR Towers

AK	Juneau International
AZ	Grand Canyon Municipal
CA	Napa County
CA	Santa Rosa Sonoma
IN	Lafayette/Perdue University
MI	Traverse City
VA	Manassas Regional/Davis Field

Subtotal 7

### ATC Level 6 VFR Towers

CA	Concord/Buchanan Field
CA	El Monte
CA	Hayward Air Terminal
CA	Livermore Municipal
CA	Sacramento International
CO	Denver/Jeffco
DE	Wilmington/New Castle
FL	Ft. Pierce
FL	Vero Beach
IL	Cahokia/St. Louis
IL	Chicago/Aurora Municipal
KY	Louisville Bowman
LA	New Orleans/Lakefront
MI	Ann Arbor Municipal
MI	Detroit Willow Run
MN	St. Paul Downtown
MO	Spirit of St. Louis
NY	Poughkeepsie/Dutchess
OR	Portland-Hillsboro
PA	Northeast Philadelphia
PA	Pittsburgh/Allegheny County
TX	Fort Worth/Alliance
WA	Everett Paine Field

Subtotal 23

### ATC Level 8 VFR Towers

<i>AZ</i>	<i>Phoenix-Deer Valley Municipal</i>
<i>FL</i>	<i>Orlando/Sanford</i>
<i>MI</i>	<i>Pontiac/Oakland International</i>
<i>OK</i>	<i>Tulsa/Riverside</i>
<i>WA</i>	<i>Seattle/Boeing Field</i>

Subtotal 5

*Towers bolded and italicized were among FAA's 50 busiest towers (in terms of airport operations) as of March 2003.*

### ATC Level 7 VFR Towers

AK	Anchorage/Merrill Field
<b><i>AZ</i></b>	<b><i>Mesa/Falcon Field</i></b>
<b><i>AZ</i></b>	<b><i>Prescott/EA Love Field</i></b>
AZ	Scottsdale
CA	Camarillo
CA	Carlsbad/McClellan
CA	Chino
CA	La Verne/Bracket Field
CA	Palo Alto
CA	San Diego/Gillespie Field
CA	San Diego/Montgomery
CA	San Jose/Reid-Hillview
CA	Santa Monica Municipal
CA	Torrance/Zamperini Field
FL	Fort Lauderdale Executive
FL	Miami/Kendall-Tamiami
FL	Orlando Executive
GA	Atlanta/Dekalb-Peachtree
IL	Chicago/Du Page
IL	Chicago/Palwaukee Municipal
MA	Bedford/Hanscom Field
MA	Nantucket Memorial
MN	Minneapolis/Crystal
MN	Minneapolis/Flying Cloud
<b><i>ND</i></b>	<b><i>Grand Forks International</i></b>
NJ	Caldwell/Essex County
NJ	Morristown Municipal
NV	North Las Vegas
NY	Farmingdale/Republic
TX	Dallas Addison
TX	Tomaball D.W. Hooks
VA	Newport News

Subtotal 32

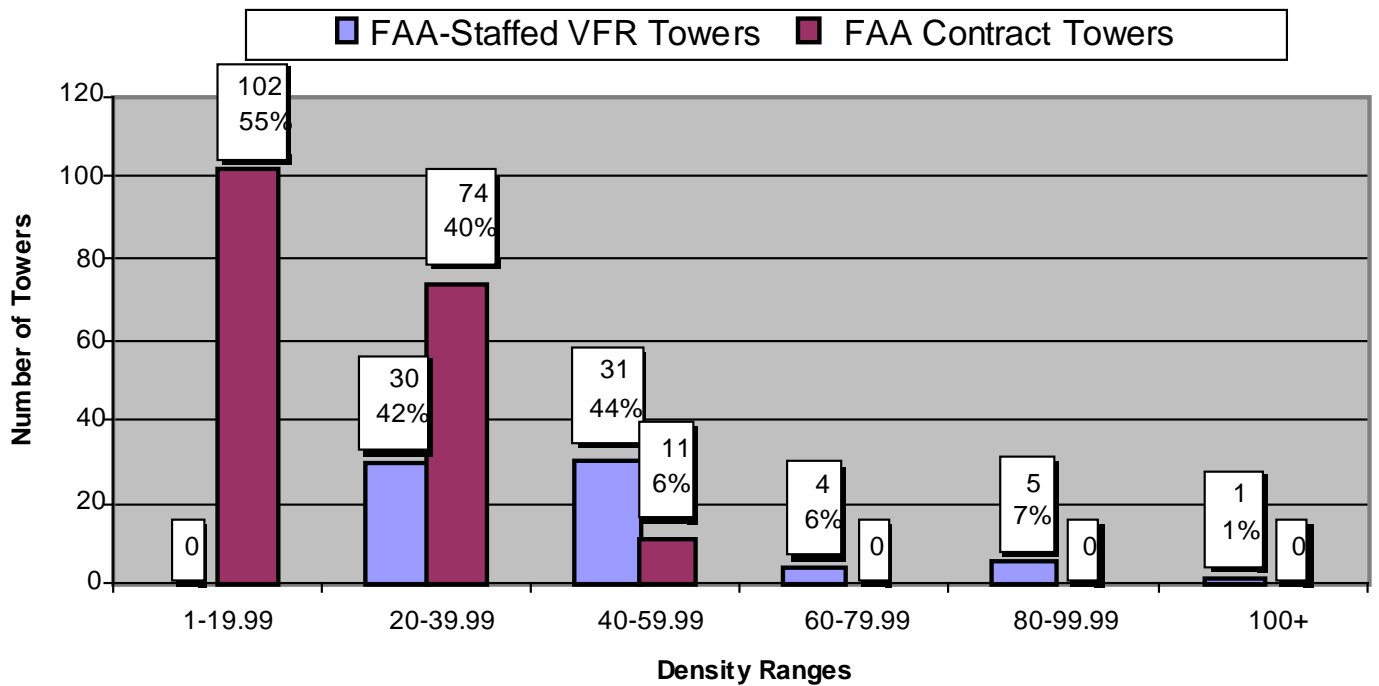
### ATC Level 9 VFR Towers

<i>CA</i>	<i>Long Beach/Daugherty</i>
<i>CA</i>	<i>Van Nuys</i>
<i>CO</i>	<i>Denver/Centennial</i>
TX	Fort Worth Meacham

Subtotal 4



## EXHIBIT D. AVERAGE NUMBER OF HOURLY AIR TRAFFIC OPERATIONS HANDLED (AIR TRAFFIC DENSITY) FOR FISCAL YEAR 2002



Source: FAA Office of Aviation Policy and Plans  
 Data unavailable for 32 FAA Contract Towers (14.61%)

Exhibit D. Average Number of Hourly Air Traffic Operations Handled (Air Traffic Density) for Fiscal Year 2002

## EXHIBIT E. OPERATIONAL ERRORS/DEVIATIONS BY LOCATION FOR FISCAL YEARS 2002 AND 2001

### FAA Contract Towers FY 2002

Identifier	Facility	OE	OD	OE + OD
ADQ	Kodiak, AK	1		1
ATW	Appleton, WI	1		1
BZN	Gallatin Field, MT	1		1
CHD	Chandler, AZ	1		1
CRG	Jacksonville/Craig, FL		1	1
LIH	Lihue, HI	1		1
PWA	Oklahoma City/Wiley, OK		1	1
SSF	Stinson, TX	1		1
Total				8

### FAA-Staffed VFR Towers FY 2002 (numbers in parentheses are ATC grades)

FCM	Flying Cloud, MN (7)	4	1	5
CNO	Chino, CA (7)	2	1	3
PDK	Peachtree, GA (7)	2	1	3
ADS	Dallas Addison, TX (7)		2	2
AGC	Allegheny County, PA (6)	2		2
BFI	Seattle/Boeing, WA (8)		2	2
DVT	Deer Valley, AZ (8)		2	2
FXE	Ft. Lauderdale Exec., FL (7)	1	1	2
JNU	Juneau, AK (5)	1	1	2
LGB	Long Beach, CA (9)	2		2
MRI	Merrill Field, AK (7)	2		2
APC	Napa County, CA (5)		1	1
BED	Bedford/Hanscom Field, MA (7)		1	1
BJC	Jeffco Airport, CO (6)	1		1
CDW	Essex County, NJ (7)	1		1
FRG	Farmingdale, NY (7)	1		1
GFK	Grand Forks, ND (7)		1	1
LOU	Louisville, KY (6)	1		1
MYF	Montgomery, CA (7)	1		1
VNY	Van Nuys, CA (9)	1		1
VRB	Vero Beach, FL (6)	1		1
YIP	Willow Run, MI (6)	1		1
Total				38

### FAA Contract Towers FY 2001

Identifier	Facility	OE	OD	OE + OD
AHN	Athens/Ben Epps, GA	1		1
BET	Bethel, AK	1		1
BKL	Burke Lakefront, OH	1		1
BRO	Brownsville, TX	1		1
CHD	Chandler, AZ	1		1
RDM	Redmond, OR	1		1
SFF	Spokane, WA	1		1
SIG	San Juan/Dominicci, PR	1		1
TTD	Troutdale, OR		1	1
UGN	Waukegan, IL	2		2
Total				11

### FAA-Staffed VFR Towers

BED	Bedford/Hanscom, MA (7)		1	1
BJC	Jeffco, CO (6)		1	1
CDW	Essex County, NJ (7)	2		2
DVT	Deer Valley, AZ (8)	1		1
FFZ	Mesa/Falcon, AZ (7)	1		1
FPR	Fort Pierce, FL (6)	1		1
FRG	Farmingdale, NY (7)	1		1
FXE	Ft. Lauderdale Exec., FL (7)	3		3
GFK	Grand Forks, ND (7)		1	1
JNU	Juneau, AK (5)	2		2
MRI	Anchorage, AK (7)	2		2
MYF	Montgomery, CA (7)	1		1
ORL	Orlando Exec., FL (7)	2		2
PAE	Everett, WA (6)		2	2
POC	Brackett Field, CA (7)		1	1
PRC	Prescott, AZ (7)	1		1
PWK	Palwaukee, IL (7)	1		1
SMO	Santa Monica, CA (7)	1	1	2
VGT	Las Vegas, NV (7)	1	1	2
VRB	Vero Beach, FL (6)	1		1
YIP	Willow Run, MI (6)		2	2
Total				31

## EXHIBIT F. COST COMPARISON OF FAA-STAFFED VFR TOWERS AND CONTRACT TOWERS: FY 2000-FY 2002

Category	FAA-Staffed VFR Towers	Full-Funded Contract Towers	Cost Share Contract Towers	Total Contract Tower Program
<b>FY 2000</b>				
Number of Towers at Start of FY 00	71	163	0	163
Number of Towers at End of FY 00	71	187	10	197
Total Costs	\$105,964,255	\$55,600,000	\$1,350,000	\$56,950,000
Average Cost Per Tower	\$1,492,454	\$297,326	\$135,000	\$289,086
<b>FY 2001</b>				
Number of Towers at Start of FY 01	71	187	10	197
Number of Towers at End of FY 01	71	187	18	205
Total Costs	\$115,906,752	\$62,900,000	\$3,400,000	\$66,300,000
Average Cost Per Tower	\$1,632,489	\$336,364	\$188,889	\$323,415
<b>FY 2002</b>				
Number of Towers at Start of FY 02	71	187	18	205
Number of Towers at End of FY 02	71	189	30	219
Total Costs	\$123,677,352	\$69,100,000	\$4,400,000	\$73,500,000
Average Cost Per Tower	\$1,741,935	\$365,608	\$146,667	\$335,616
<b>Increase in Number of Towers (Beg. FY 2000 – End of FY 2002)</b>	<b>0.0%</b>	<b>16.0%</b>	<b>N/A</b>	<b>34.4%</b>
<b>Percentage Increase in Total Costs</b>	<b>16.7%</b>	<b>24.3%</b>	<b>225.9%</b>	<b>29.1%</b>
<b>Percentage Increase in Average Cost Per Tower</b>	<b>16.7%</b>	<b>23.0%</b>	<b>8.6%</b>	<b>16.1%</b>

SOURCE: FAA

## EXHIBIT G. FY 2002 COST COMPARISONS OF SELECTED COMPARABLE FAA-STAFFED VFR TOWERS AND CONTRACT VFR TOWERS

### FAA VFR Towers

Tower	ATC Level	Density	Cost
Concord, CA	6	29.92	\$1,496,279.94
Everett, WA	6	52.84	\$1,244,865.62
Fort Pierce, FL	6	41.14	\$1,673,103.01
Hillsboro, OR	6	51.69	\$1,130,699.24
Juneau, AK	5	34.63	\$1,242,796.64
Lafayette, IN	5	37.19	\$1,259,123.27
Livermore, CA	6	49.95	\$1,222,477.28
Manassas, VA	5	31.39	\$1,399,207.35
Napa, CA	5	34.38	\$1,175,907.22
Santa Rosa, CA	5	30.98	\$1,297,417.15
Traverse City, MI	5	33.05	\$1,205,987.34
Vero Beach, FL	6	50.05	<u>\$1,780,143.64</u>
<b>Total</b>			<b>\$16,128,007.70</b>
	<b>Average Cost</b>		<b>\$1,344,000.64</b>
	<b>Density Range</b>		<b>29.92 – 52.84</b>

### Fully Funded Contract Towers

Tower	Density	Cost
Anoka, MN	35.74	\$417,036.00
Carbondale, IL	40.59	\$338,280.00
Chandler, AZ	48.88	\$513,620.00
Gateway, AZ	41.32	\$486,707.00
Gwinnett, GA	33.85	\$362,100.00
Hollywood, FL	33.81	\$441,096.00
Lakeland, FL	30.76	\$445,278.00
Norman, OK	32.02	\$366,215.26
Pompano Beach, FL	44.61	\$367,440.00
Ryan Field, AZ	35.41	\$449,755.00
San Carlos, CA	39.20	\$413,180.00
Stewart, NY	28.22	<u>\$521,340.00</u>
<b>Total</b>		<b>\$5,122,047.26</b>
	<b>Average Cost</b>	<b>\$426,837.27</b>
	<b>Density Range</b>	<b>28.22 – 48.88</b>

<b>Average Cost of Selected FAA-staffed VFR Towers</b>	<b>\$1,344,000.64</b>
<b>Average Cost of Selected Full-Funded Contract Tower</b>	<b><u>\$426,837.27</u></b>
<b>Cost Difference</b>	<b>\$917,163.37</b>

## **EXHIBIT H. SCOPE AND METHODOLOGY**

The objective of this review was to provide an independent analysis of comparable data concerning VFR towers in FAA's Contract Tower Program and VFR towers staffed with FAA controllers. We conducted this analysis as part of our ongoing oversight responsibility of the Contract Tower Program and at the request of the President of the National Air Traffic Controllers Association (NATCA) who, in a July 30, 2003 letter, asked that we review cost-related issues associated with the Contract Tower Program.

Because safety is the primary mission of all air traffic control facilities, we expanded the scope of the analysis to include metrics on safety and operational issues of contract towers as well. We also analyzed comparable data for 71 FAA-staffed VFR towers.

We conducted the review in accordance with Government Auditing Standards prescribed by the Comptroller General of the United States. We are making no recommendations in this report, and there are no actions or management comments required from FAA management.

Our analysis was conducted between August 8, 2003, and September 1, 2003. The focus of our review was analysis of data related to costs, operations, safety, and staffing for FAA's contract towers and FAA-staffed VFR towers. Information used on the number of contract towers and their annual obligations was obtained from FAA's Contract Tower Program Branch.

To evaluate the safety of operations between contract towers and FAA-staffed VFR towers, we reviewed FAA-provided data on the number of operational errors and deviations that occurred at each facility in FY 2001 and FY 2002. We then calculated the rate of operational errors/deviations per million operations at each location, using data provided by FAA.

To determine average staffing levels, we reviewed staffing requirements included in the contracts for all contract towers and obtained on-board staffing levels for FAA-staffed VFR towers from FAA's Office of Air Traffic Resource Management. We also reviewed data regarding operations and average air traffic density from data base information compiled by FAA's Office of Aviation Policy and Plans.

To compare costs of comparable FAA-operated and contract towers in FY 2002, we selected 12 FAA-staffed VFR towers and 12 contract towers with comparable average air traffic density. We then obtained costs for each contract tower from

the contracts and the costs for each of the 12 FAA-staffed towers from FAA's Office of Air Traffic Resource Management.<sup>12</sup>

We then computed an average cost for each group and calculated the difference between the two groups. We compared our cost difference to a cost estimate made by FAA in 1999 using the same towers and computed the difference between our analysis and FAA's analysis. Finally, we met with representatives from the National Air Traffic Controllers Association and the American Association of Airport Executives to obtain their opinions and insights about both contract towers and FAA-staffed VFR towers.

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<sup>12</sup> We did not include program costs or overhead costs for either group.