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Report to Congressional Requesters

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AIR TRAFFIC CONTROL

Surveillance Radar Request for the Cherry Capital Airport

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Resources, Community, and
Economic Development Division

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The Honorable Richard C. Shelby
Chairman
The Honorable Frank Lautenberg
Ranking Minority Member
Subcommittee on Transportation
Committee on Appropriations
United States Senate

The Honorable Frank R. Wolf
Chairman
The Honorable Martin Olav Sabo
Ranking Minority Member
Subcommittee on Transportation
and Related Agencies
Committee on Appropriations
House of Representatives

In 1994, the Federal Aviation Administration (FAA) received requests from Members of Congress, air traffic controllers, and local citizens to install an airport surveillance radar at the Cherry Capital Airport in Traverse City, Michigan, which is located in the upper northwest corner of the state.[1] These groups anticipated that having a radar located at the airport would help better manage air traffic and, thus, improve safety and reduce aircraft delays. In response to the requests, FAA assessed the benefits and costs of installing a surveillance radar at the airport. Initially, in 1994, on the basis of a benefit-cost study, the airport qualified for a radar; however, the results of benefit-cost studies conducted in 1996 and 1997 showed that the airport did not qualify for a radar, and therefore, it has not received a radar to date.[2]

As directed by the conferees on the Department of Transportation and Related Agencies Appropriations Act for fiscal year 1998,[3] we performed a detailed review of the benefit-cost studies that FAA conducted for the

[1]Air traffic controllers working for FAA use airport surveillance radars to separate and control aircraft approaching and departing airports within a 60-mile radius. In the rest of this report, airport surveillance radars are referred to simply as surveillance radars.

[2]FAA conducted three benefit-cost studies: (1) What we refer to as the 1994 study included air traffic projections that began in 1994; this study was issued in March 1994. (2) What we refer to as the 1996 study included projections that began in 1996; it was issued in March 1997. (3) What we refer to as the 1997 study included projections that began in 1997; it was issued in October 1997.

[3]House Conference Report No. 105-313 (October 7, 1997), p. 44.

Cherry Capital Airport in 1994, 1996, and 1997. Specifically, this report discusses (1) FAA's decision-making process for installing surveillance radars at airports; (2) the factors, including costs, benefits, and air traffic projections, that FAA considered when conducting the 1994, 1996, and 1997 studies; (3) the impact, if any, that air traffic projections developed by other sources would have had on the results of the 1997 study; (4) actions FAA has taken to address safety concerns at the airport; and (5) FAA's plans to replace surveillance radars at airports with fewer total air traffic operations than the Cherry Capital Airport.

Results in Brief

FAA uses a multifaceted process to determine which airports should get surveillance radars. This process includes completing a benefit-cost study, assessing an airport's need for a surveillance radar compared with the needs of other airports, and determining the availability of radar equipment or funds to purchase the needed radar equipment. In its 1994 benefit-cost study for the Cherry Capital Airport, FAA officials overstated the projected air traffic growth; this overstated growth was the primary reason FAA concluded that the airport met its cost-effectiveness criteria. Moreover, in 1994, FAA officials did not follow the agency's decision-making process and prematurely concluded that the Cherry Capital Airport qualified for a surveillance radar. Specifically, FAA headquarters and regional officials did not assess the airport's needs relative to the needs of other airports or consider the radar coverage already provided by a nearby long-range surveillance radar. According to FAA officials, if they had considered other airports' needs and the existing radar coverage when conducting the 1994 study, as required by the agency's process, the Cherry Capital Airport would not have been considered qualified for a surveillance radar. In addition, the officials told us that installing a surveillance radar at the Cherry Capital Airport would not improve safety and would only duplicate existing radar coverage.

When conducting the 1994, 1996, and 1997 benefit-cost studies, FAA considered the potential efficiency and safety benefits (such as travelers' time saved because of the reduced delays to aircraft and the lives saved because of the reduced risks of midair and terrain collisions), estimated equipment and annual operating costs, and projected air traffic operations (takeoffs and landings). Although FAA considered the appropriate factors when conducting the studies, different equipment and operating costs and different air traffic projections were included in the studies. FAA officials could not explain or provide documentation that showed why there were differences among the costs included in the 1994 and 1996 studies.

Documentation was available, however, for the 1997 study. In projecting annual air traffic, FAA officials estimated a 4.2-percent average annual growth rate in the 1994 study and about a 1-percent growth rate in the 1996 and 1997 studies. With the higher growth rate used in the 1994 study, the benefits exceeded the costs of installing a surveillance radar, so the Cherry Capital Airport met FAA's cost-effectiveness criteria; but with the lower growth rate used in the 1996 and 1997 studies, it did not qualify. FAA officials were unable to explain how the projections in the 1994 study were developed. In all three studies, the projections overstated actual air traffic thus far, particularly the 1994 study. For example, the 123,957 actual air traffic operations reported for 1997 were considerably less than the 152,000 operations projected in the 1994 study, the 130,078 projected in the 1996 study, and the 130,318 projected in the 1997 study.

Because the air traffic projections were the most critical factors influencing the results of FAA's benefit-cost studies, we obtained a set of air traffic projections developed in 1996 and used by two consulting firms for studies conducted for the Michigan Department of Transportation and the Northwest Regional Airport Commission. The projections used by the firms were based on a higher annual rate of growth for air traffic and a higher baseline of air traffic operations than FAA's projections. When we substituted the firms' projections in the 1997 study, it resulted in the benefits exceeding the costs and in the Cherry Capital Airport's meeting FAA's cost-effectiveness criteria. However, we found that FAA's air traffic projections were a more appropriate basis for its decision on whether to install a surveillance radar at the airport.

To address the safety concerns, FAA installed an automated display and information system at the Cherry Capital Airport in 1997 to help controllers locate and identify aircraft approaching and departing the airport. While the controllers told us that the equipment can help them better manage air traffic and improve safety, they have difficulty using it because information on aircraft identification and altitude is sometimes unreadable on the display monitor. According to FAA headquarters and regional officials, this problem does not affect safety at the airport because, unlike a surveillance radar, this additional equipment is only intended to be used as a visual aid and not to control or separate aircraft. Air traffic controllers at the Minneapolis Air Route Traffic Control Center are responsible for providing radar control and separation services to aircraft approaching the airport until control of the aircraft is switched to the Cherry Capital controllers.

Beginning in 1999, FAA plans to replace the existing surveillance radars installed in the 1960s and 1970s at 101 airports as part of its efforts to modernize its air traffic control system. Seventy-five of the 101 airports had fewer total air traffic operations in 1996 than the Cherry Capital Airport did. In other words, FAA will spend over $375 million to purchase replacement radars for airports that have had low levels of air traffic. This cost does not include the additional expenditures for any auxiliary equipment and infrastructure modifications required for effective operation of the radars. Although FAA conducts benefit-cost studies and uses air traffic operations as a basis for determining the cost-effectiveness of installing surveillance radars at airports, agency officials did not conduct similar studies to determine whether it would be cost-effective to replace existing radars at the 101 airports or to prioritize the replacement of the radars. FAA officials agreed that conducting these studies would be useful. However, they have no plans to undertake such efforts because agency officials believe that it would be very difficult to discontinue radar operations at an airport because of the public's perception that safety would be reduced.

Background

Surveillance radars allow air traffic controllers to manage aircraft operating in the airspace around airports and to expedite the flow of air traffic into and out of airports by reducing the separation between aircraft. Currently, radar coverage for the Cherry Capital Airport is provided by a long-range surveillance radar in Empire, Michigan, 20 miles away from the airport.[4] Although the radar is located near the Cherry Capital Airport, its signals are transmitted over 300 miles away to the Air Route Traffic Control Center in Minneapolis, where the controllers there are responsible for using instrument flight or radar rules to control the aircraft approaching and departing the airport outside a 5-mile radius of the airport. Controllers at the Cherry Capital Airport use visual flight rules or visual procedures to manage aircraft within the 5-mile radius during the normal tower operating hours from 7 a.m. to 10 p.m. However, aircraft are allowed to take off and land at the airport when the tower is closed.

FAA conducted a study in 1994 to assess the benefits and costs of installing a surveillance radar at the airport. The results showed that the potential benefits of installing a radar exceeded the costs. Therefore, FAA concluded that the airport qualified for a radar. Because no radar was available and funds were unavailable to purchase a new radar, FAA added the airport to a

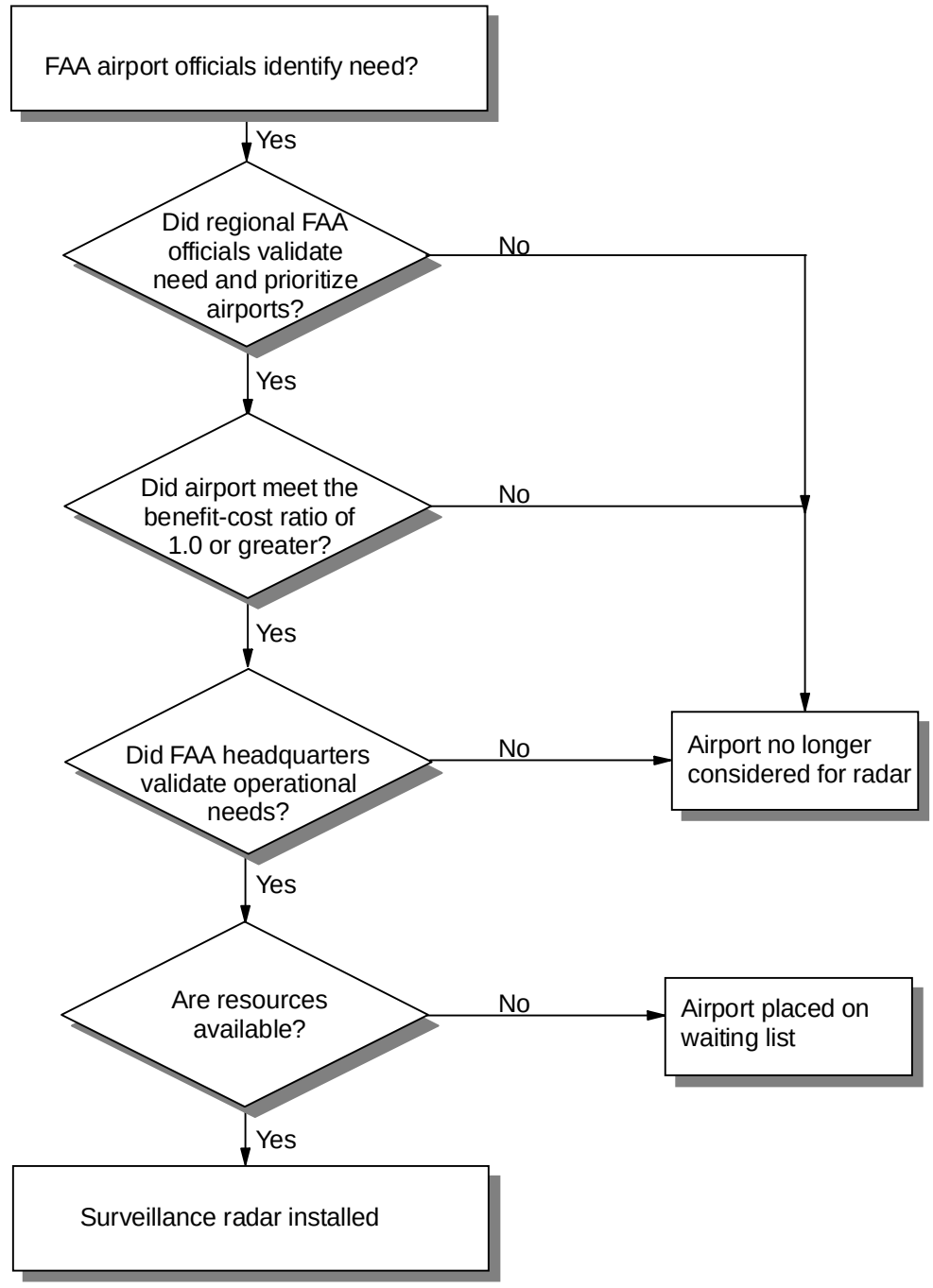
[4]Air traffic controllers use the long-range surveillance radar to control aircraft in terminal areas and to separate and control air traffic en route between airports.

waiting list of other qualifying airports. At the request of Members of Congress, FAA conducted another benefit-cost study in 1996 to determine whether the airport still qualified for a radar. The results of that study showed that the costs exceeded the benefits, thereby disqualifying the airport for a radar, and FAA removed the airport from its waiting list of qualifying airports. At our request, FAA conducted another benefit-cost study in 1997 to determine whether the airport qualified for a surveillance radar. That study's results also showed that the costs exceeded the benefits and that the airport did not qualify for a radar.

FAA's Decision-Making Process for Installing Surveillance Radars at Airports

FAA uses a multifaceted process to determine which airports should get surveillance radars. (See fig. 1.) First, FAA officials at the airport identify an operational need—such as the need to reduce delays to aircraft taking off and landing and the risks of midair and terrain collisions—that they believe a surveillance radar would satisfy. They then submit a written request to the appropriate FAA regional office.

Figure 1: FAA's Process for Determining Which Airports Without Radars May Be Eligible for Surveillance Radars



Second, FAA regional officials review the request to determine whether an operational need exists, assess the airport's need relative to those of other airports in the region, and prioritize all airports within the region that have valid radar needs. If regional officials determine that a need exists, the request is forwarded to FAA headquarters. They also include an estimate of the equipment and annual operating costs in the region's annual budget. If they determine that an operational need does not exist, the airport is no longer considered a potential candidate for a surveillance radar.

Third, FAA headquarters officials use the agency's Investment Criteria for Airport Surveillance Radar, dated May 1983, to determine whether an airport identified by the regional officials as a candidate for a radar meets FAA's cost-effectiveness criteria. Specifically, the officials conduct a detailed study using site-specific air traffic data, along with estimated equipment and operating costs, to assess the potential benefits and costs for installing a radar at the airport. If the benefits exceed the costs, further consideration is given to the request. If the costs exceed the benefits—that is, if the benefit-cost ratio is less than 1.0—the airport is no longer considered a potential candidate for a surveillance radar.

Fourth, FAA headquarters officials validate the operational needs by considering, among other things, the level of air traffic operations at the airport and the complexity of its airspace compared with those of other airports nationwide. If the officials conclude that a radar is needed, the request is approved. If FAA headquarters cannot validate the operational needs, the airport is no longer considered a potential candidate for a surveillance radar.

Finally, if a radar is available from another airport where an upgraded radar has been installed, or if funds are available to purchase a new radar, the radar is acquired and installed at the airport. Otherwise, the airport is placed on a waiting list. Once radars or funds become available, however, FAA must determine whether the airports on the waiting list still meet its cost-effectiveness criteria by using the latest air traffic operations data. Airports that do not meet the criteria are no longer considered candidates for a surveillance radar.

In addition to the radar requests initiated by FAA airport and regional officials, the Congress may mandate that a surveillance radar be installed at an airport.[5] If the Congress designates funds with the mandate, the

[5]For this report, FAA references to Congressional mandates are referring to committee and conference reports directing FAA to install radars at particular airports.

request does not have to follow FAA's decision-making process. If the Congress does not designate funds, however, the request must follow the process, according to FAA headquarters officials. The Congress has mandated that FAA install surveillance radars at eight airports. These airports are included in appendix I.

Although FAA's decision-making process was in place in 1994, agency officials did not follow it before concluding that the Cherry Capital Airport qualified for a radar. For example, after conducting the 1994 benefit-cost study and determining that the airport met FAA's cost-effectiveness criteria, agency officials prematurely concluded that Cherry Capital qualified for a radar. They did not assess the airport's operational needs relative to the needs of other airports or consider the radar coverage already provided by the long-range surveillance radar nearby in Empire, Michigan. According to FAA officials, if these factors had been considered, the Cherry Capital Airport would not have qualified for a surveillance radar.

The officials also told us that even if the airport had a benefit-cost ratio of 1.0 or greater, it still would not get a surveillance radar because other airports have greater operational needs and the airport already receives better radar coverage than many airports that have surveillance radars on site. They added that if a radar was installed at the airport, its signal would most likely be transmitted to another air traffic control facility where other controllers would be responsible for controlling aircraft approaching and departing the Cherry Capital Airport, an arrangement similar to the present one at the airport.

Factors FAA Considered When Conducting Benefit-Cost Studies

In accordance with its decision-making process, FAA used its investment criteria to identify the factors to consider when conducting the 1994, 1996, and 1997 benefit-cost studies for the Cherry Capital Airport. The officials calculated benefit-cost ratios of 1.66 in 1994, 0.68 in 1996, and 0.78 in 1997, which resulted in the airport meeting FAA's cost-effectiveness criteria in 1994, but not in 1996 and 1997. We found that an overstatement of air traffic growth was the primary reason the airport met the investment criteria in 1994.

FAA officials considered the potential efficiency and safety benefits, estimated the equipment and annual operating costs, and projected air traffic operations when conducting the benefit-cost studies. To calculate the efficiency and safety benefits of installing a surveillance radar, FAA considered travelers' time saved because of the potential reductions in the

delays to aircraft and the lives saved and injuries avoided because of the reductions in the risks of midair and terrain collisions.[6] To compute the benefits represented by reduced delays to aircraft and collision risks, FAA used projections of air traffic operations at the airport, the average time required for aircraft takeoffs and landings, and the percentage of time that weather conditions at the airport would require controllers to use radar to manage the air traffic. To compute the equipment and annual operating costs, FAA estimated the costs for the acquisition and installation of the radar and the annual costs for controller and support staff salaries, training, utilities, and for maintenance. The benefits and the annual operations and maintenance costs were estimated over a 15-year period and discounted to the present time using the discount rate published by the Office of Management and Budget.

FAA used both national and site-specific data to compute the benefits and costs. For example, the values for travelers' time saved, lives saved, and injuries avoided were national data published annually by the Department of Transportation. The estimated costs for acquiring the radar were FAA's purchase price for the surveillance radar plus other necessary equipment and personnel training costs. The projections of air traffic operations were specific to the Cherry Capital Airport.

Although the results of benefit-cost studies depend on several factors, FAA officials told us that the projections of air traffic operations—particularly aircraft operations controlled by instrument flight or radar rules—were the most critical factors because they affect the level of benefits that would be achieved as a result of having a surveillance radar at the airport. They commented that there was a direct correlation between the projections of air traffic operations and the benefits—as air traffic increases, so do the potential for delays to aircraft and the risks of collision, and, thus, the benefits of installing a radar at the airport also increase. In particular, we found that FAA's criteria give more weight to aircraft, such as air carriers and commuter aircraft, that carry the largest number of passengers because the higher the number of passengers, the greater the potential efficiency and safety benefits to be achieved from saving travelers' time and avoiding collisions that could cause injuries and deaths. Therefore, according to FAA headquarters officials, the potential efficiency and safety benefits calculated for having a surveillance radar at the Cherry Capital Airport, which is mainly a general aviation airport,

[6]FAA counts delays to aircraft as the number of times takeoffs are postponed 15 minutes or longer beyond scheduled departures at a given airport.

would be less than those calculated for airports that service a larger number of commercial air carriers and commuter aircraft.

Equipment and Operating Costs Differed in the Benefit-Cost Studies

FAA considered the installation of the same type of surveillance radar in all three of its studies on the Cherry Capital Airport. We found, however, that the estimated equipment costs in the 1997 study were over $8 million higher than the costs included in the other studies. Specifically, the equipment costs in the 1994 and 1996 studies totaled about $12.9 million and $13.5 million, respectively; whereas, the equipment costs totaled $22 million in the 1997 study. In contrast, the annual operating costs in the 1994 and 1996 studies totaled $611,000 and $677,000, respectively, compared with $167,000 in the 1997 study. FAA could not explain why such significant differences existed in the cost figures or provide documentation to support the costs included in the 1994 and 1996 studies. They did, however, provide support for the costs included in the 1997 study. FAA headquarters officials speculated that the costs differed because the 1994 and 1996 studies only included the costs for a surveillance radar and not the costs for the necessary auxiliary equipment.

Air Traffic Projections Differed in the Benefit-Cost Studies

To develop the air traffic projections in the 1996 and 1997 studies, FAA officials considered the historical air traffic growth at the Cherry Capital Airport and the mix of aircraft using the airport. As shown in table 1, they assumed that air traffic at the airport would grow, on average, about 1 percent annually. The FAA officials were uncertain about how the higher projections in the 1994 study were developed. They told us that the original projections were probably based on historical data, but were adjusted upward based on input from headquarters, regional, and district officials to reflect a 4.2-percent projected average annual growth rate, also shown in table 1. We could not determine the basis for the adjustments because FAA did not maintain supporting documentation. Nevertheless, FAA headquarters and regional officials, as well as the FAA officials and controllers at the Cherry Capital Airport, all agreed that the 1994 projections were overstated.

Table 1: Projected Air Traffic Operations Included in FAA's Benefit-Cost Studies

	1994 study		1996 study		1997 study	
Year	Number of operations	Percentage change[a]	Number of operations	Percentage change[a]	Number of operations	Percentage change[a]
1992	114,000	[b]	[b]	[b]	[b]	[b]
1993	124,000	8.8	[b]	[b]	[b]	[b]
1994	133,000	7.3	[b]	[b]	[b]	[b]
1995	143,000	7.5	[b]	[b]	[b]	[b]
1996	148,000	3.5	128,704	1.1	[b]	[b]
1997	152,000	2.7	130,078	1.1	130,318	1.5
1998	157,000	3.3	131,087	0.8	131,801	1.1
1999	162,000	3.2	132,281	0.9	133,277	1.1
2000	166,000	2.5	133,478	0.9	134,742	1.1
2001	172,000	3.6	134,585	0.8	136,199	1.1
2002	178,000	3.5	135,694	0.8	137,648	1.1
2003	183,000	2.8	136,806	0.8	139,089	1.0
2004	189,000	3.3	137,919	0.8	140,547	1.0
2005	194,000	2.6	138,943	0.7	141,997	1.0
2006	[c]	[c]	139,969	0.7	143,438	1.0
2007	[c]	[c]	141,173	0.8	144,875	1.0
2008	[c]	[c]	142,384	0.9	146,476	1.1
2009	[c]	[c]	143,601	0.9	148,069	1.1
2010	[c]	[c]	144,825	0.9	149,658	1.1
Projected average annual growth		4.2%		0.9%		1.1%

[a]The percentages show the change in operations (takeoffs and landings) from the previous year.

[b]Not applicable.

[c]The study only included air traffic projections up to 2005.

Source: FAA's Terminal Area Forecast Quick Reports.

For the 1996 and 1997 studies, FAA based its projections on actual air traffic growth at the airport over the 10-year periods preceding the 1996 (1986 through 1995) and 1997 (1987 through 1996) studies. As shown in table 2, the actual annual growth of air traffic from fiscal year 1986 through fiscal year 1996 ranged from an increase of 22.5 percent to a decrease of about 6.5 percent. According to FAA officials, the large increase in air traffic in fiscal year 1987 was due to the introduction of new air carrier service at the airport. Because the officials did not expect such a

large increase in air traffic to reoccur in future years, they excluded the surge in air traffic in fiscal year 1987 from the air traffic projections in the 1996 and 1997 studies. Therefore, the resulting average annual growth rate used in the 1996 and 1997 studies was about 1 percent. Also, as illustrated in tables 1 and 2, the 128,704 projected air traffic operations included in the 1996 study more closely tracked the 128,419 actual operations that occurred in 1996 than the 148,000 operations projected in the 1994 study. Even so, the 123,957 actual air traffic operations reported for fiscal year 1997 were considerably less than the 152,000 projected in the 1994 study, the 130,078 projected in the 1996 study, and the 130,318 projected in the 1997 studies.

Table 2: Actual Air Traffic Operations at the Cherry Capital Airport From 1986 Through 1997

Year	Number of operations	Percentage change
1986	95,626	[a]
1987	117,143	22.5[b]
1988	126,472	8.0
1989	127,522	0.8
1990	120,264	–5.7
1991	121,842	1.3
1992	113,875	–6.5
1993	114,789	0.8
1994	124,000	8.0
1995	127,341	2.7
1996	128,419	0.8
1997	123,957	–3.5

[a]Not applicable.

[b]According to data obtained from FAA, the large increase in air traffic in 1987 was due to the introduction of air carrier service at the airport.

Source: FAA's Terminal Area Forecast Quick Reports.

Impact of Other Air Traffic Projections on the 1997 Benefit-Cost Study

Since air traffic projections were the most critical factors influencing the results of the benefit-cost studies for the Cherry Capital Airport, we requested air traffic projections developed by the state of Michigan and Traverse City transportation planning officials to determine what impact their projections would have had on the results of FAA's 1997 study. We found, however, that the state and local officials relied routinely on FAA's

air traffic projections and, therefore, that using their projections would not have had any impact on the 1997 study results.

We did, however, identify another set of air traffic projections developed in 1996 (based on 1994 actual air traffic data), which had been used by two consulting firms. The firms used the projections in studies conducted for the Michigan Department of Transportation and the Northwestern Regional Airport Commission to identify facility improvements needed at the Cherry Capital Airport, such as expanding the terminal building and parking areas. The projections the firms used were based on a higher annual air traffic growth rate and a higher baseline of air traffic operations than FAA's projections. Whereas FAA projected an average annual growth rate of 1 percent in its 1996 and 1997 studies, the firms projected a growth rate of about 1.5 percent. Also, FAA's actual air traffic count of 124,000 for 1994 included only aircraft operations that were managed by the Cherry Capital and the Minneapolis controllers. The firms added 18,000 operations to FAA's air traffic count by including an estimate of aircraft operations that were not managed by the controllers because they occurred at Cherry Capital when the tower was closed. While the firms' count might have been appropriate for determining facility needs, FAA's count was more appropriate for determining radar needs.

Nonetheless, we asked FAA to conduct a benefit-cost study using the firms' projections to determine the impact on the 1997 study. When the air traffic projections developed by the firms were used, they produced a benefit-cost ratio of 1.35, which exceeded the minimal threshold for meeting FAA's cost-effectiveness criteria to qualify for a surveillance radar. However, as mentioned previously, FAA officials told us that even if the airport were to achieve a benefit-cost ratio of 1.0 or greater, it still would not get a surveillance radar because other airports have greater operational needs and the airport already receives better radar coverage than many other airports that have surveillance radars.

Actions FAA Has Taken to Address Safety Concerns at the Cherry Capital Airport

In response to the safety concerns raised by Members of Congress and controllers at the Cherry Capital Airport, such as the greater risk of aircraft collisions that results from increased air traffic, FAA installed a Terminal Automated Radar Display and Information System (TARDIS) in 1997 to help the controllers locate and identify aircraft approaching or departing the airspace around the airport. The TARDIS is a commercial, off-the-shelf system that consists of a computer, monitor, and software costing about $23,000. Although the system displays data, such as aircraft

speed and altitude, received directly from the surveillance radar in Empire, Michigan, the Cherry Capital controllers can only use it as a visual aid and cannot use it to control or separate aircraft. According to FAA regulations, the Cherry Capital Airport controllers can only use visual procedures or visual flight rules to track aircraft.

Controllers at the Cherry Capital Airport told us that the TARDIS has helped them manage air traffic better, but that they have had difficulty using it. They said that, on occasion, the information the TARDIS has displayed on aircraft identification and altitude, for example, has overlapped and has sometimes been unreadable.

FAA headquarters and regional officials agreed that the data display problem exists occasionally but said that it is not unique to the TARDIS at the Cherry Capital Airport. They commented that the problem does not compromise safety at the airport because the additional equipment is only intended to be used as a visual aid and not to control air traffic. Moreover, the Minneapolis controllers use the radar in Empire to track aircraft flying under instrument flight rules until control of the aircraft is switched, via radio contact, to the Cherry Capital controllers. The switch usually occurs within a 5- or 10-mile radius of the airport. Also, FAA's regulations require that pilots contact the Cherry Capital controllers prior to entering the airport's airspace. According to the officials, the TARDIS provides two benefits to the Cherry Capital controllers—enhanced traffic monitoring capabilities and data directly from the radar in Empire. Even if the automated system at the Minneapolis facility fails, the TARDIS would still receive data from the Empire radar.

FAA Plans to Replace Surveillance Radars at Airports With Fewer Total Air Traffic Operations Than the Cherry Capital Airport

Beginning in 1999 and continuing through 2004, FAA plans to retire all of the older airport surveillance radars (ASR), specifically ASR-7 and ASR-8, which were installed in the 1960s and 1970s. These radars, currently located at 101 airports, will be replaced as part of FAA's efforts to modernize its air traffic control system with new, technologically advanced ASR-11 radars, which cost over $5 million each.[7] During our review, we found that 75 of the 101 airports scheduled to have their radars upgraded had fewer total air traffic operations than the Cherry Capital Airport in 1996 and that FAA will spend well over $375 million to purchase replacement radars for these airports. This cost does not include the

[7]FAA initiated the modernization program in 1981 to enhance safe and efficient air travel. This program consists primarily of the acquisition and installation of radar, automation, and communications equipment.

additional expenditures for auxiliary equipment and for the modifications to airport infrastructure required for the effective operation of the radars.

We noted that FAA officials routinely conduct benefit-cost studies using air traffic operations as one of the critical factors in deciding whether it would be cost-effective to install surveillance radars at airports without radars. Yet FAA officials did not conduct similar studies to determine whether it would be cost-beneficial to replace all of the existing ASR-7 and ASR-8 radars, to prioritize replacement of the radars, or to assess whether the circumstances that initially warranted installation of the radars at the airports had changed over the years. The officials agreed that the results of benefit-cost studies would be a relevant factor in deciding whether to install the replacement radars. But they said they have no plans to conduct such studies because they believe that it would be very difficult to discontinue radar operations at an airport found not to qualify because the public's perception would be that safety was being reduced, even if safety was not compromised and other circumstances warranted the discontinuance of radar operations. FAA's past practice has been that once an airport gets a radar, it qualifies for a replacement radar regardless of changes in the air traffic or the other circumstances that initially warranted the radar. Although FAA has criteria for discontinuing radar operations, the agency has never done so.

FAA officials also explained that there may be other important reasons, besides cost-effectiveness, for replacing or installing a radar at an airport. These reasons include an airport's location; the complexity of the airspace surrounding an airport; the capacity of an airport to serve multiple satellite airports; the capacity of an airport to provide relief capacity to hub or major airports on an as needed basis; and national security. We asked FAA for documentation of the operational needs that showed why the radars were installed initially at the 75 airports with fewer total air traffic operations than the Cherry Capital Airport that are scheduled to have their radars replaced. In response, FAA headquarters officials contacted the airports to obtain information on the rationale for installing the radars. Among the reasons FAA provided were that some of the airports provide radar services to the Air National Guard, military bases, and multiple satellite airports or serve as alternates for major airports or that the radars are the only sources for radar coverage in mountainous areas. FAA also cited congressional interest as a reason for installing surveillance radars at some airports. We were unable to verify the validity of FAA's rationales because FAA did not have records dating back to the 1960s and 1970s to document why the radars were installed. FAA's information, however,

shows that at some of the airports, the circumstances that originally justified the installation of radars no longer exist. See appendix II for a list of the 75 airports and more details about FAA's justifications for the initial installation of the radars in 1960s and 1970s.

Although installing and retaining radars at some of the airports with fewer total air traffic operations than the Cherry Capital Airport might be justified, conducting benefit-cost studies and revalidating the operational needs would ensure that (1) radars are installed or replaced first at the airports that have the greatest needs and (2) FAA is not spending millions of dollars to replace radars when continued operation of the existing radars might not be justified. Since FAA already has a process in place for conducting benefit-cost studies, we believe that the time and costs associated with conducting similar studies to determine the effectiveness of replacing existing radars would be minimal.

Conclusions

An overstatement of projected air traffic growth was the primary reason the Cherry Capital Airport met FAA's cost-effectiveness criteria in 1994, and agency officials prematurely concluded that the airport qualified for a surveillance radar. FAA officials expected a higher rate of growth for air traffic at the airport in future years, and as a result, the potential benefits of installing a radar were greater than the costs. If FAA had included less optimistic air traffic projections in its 1994 study, the Cherry Capital Airport would not have met the agency's cost-effectiveness criteria. Furthermore, if FAA had followed its decision-making process by assessing the airport's needs relative to other airports' needs and considered the existing radar coverage, the airport would not have been considered for a surveillance radar. Even if the benefits exceeded the costs, there was no guarantee that the airport would get a radar because of the competing needs of other airports within the region and the quality of service that the radar in Empire, Michigan, already provides to the Cherry Capital Airport.

Safety and confidence in the national airspace system are very important, and several factors must be considered when making decisions regarding the installation and replacement of surveillance radars. However, FAA's current plans to install replacement radars without conducting benefit-cost studies and revalidating operational needs may result in the agency spending millions of dollars to replace radars at airports with fewer air traffic operations than the Cherry Capital Airport, which does not meet FAA's cost-effectiveness criteria for having a radar. FAA's perceived difficulties in discontinuing radar operations at an airport only

elevate the need for conducting benefit-cost studies and assessing the operational needs. We believe that conducting benefit-cost studies and assessing operational needs before replacing the radars would allow FAA to obtain the convincing data needed to ensure that the equipment is installed at the airports that have the greatest needs and that FAA could use the data to prioritize the installation of the radars at qualifying airports. In addition, conducting these analyses would give FAA the opportunity to reassess the benefits and costs of replacing the equipment and ensure that funds are not spent to modernize radars at airports where continued radar operations might not be justified.

Recommendation

Because of current budget constraints and the future expenditures associated with installing radars as part of the effort to modernize the nation's air traffic control system, we recommend that the Secretary of Transportation direct the Administrator of the Federal Aviation Administration to conduct benefit-cost studies to validate the cost-effectiveness and revalidate the need for the radars at airports scheduled to receive replacement radars and to use the results of the studies in prioritizing the replacement of the radars at qualifying airports. Furthermore, the Federal Aviation Administration should advise the Congress on the results of these studies for its consideration during deliberations on the Department of Transportation's budget request.

Agency Comments and Our Evaluation

We provided copies of a draft of this report to the Department of Transportation and the Federal Aviation Administration for review and comment. We met with Federal Aviation Administration officials, including the Project Leader, Integrated Product Team/Terminal Surveillance Program, Communications, Navigation, Surveillance, and Infrastructure Directorate, Air Traffic Services; and Business Manager, Integrated Product Team/Terminal Surveillance Program, Office of Communication, Navigation, and Surveillance Systems, Research and Acquisitions. We also met with Department of Transportation officials from the Offices of the Assistant Secretaries for Administration and for Budget and Program Performance. The agencies generally agreed with the findings, conclusions, and recommendation presented, but commented that we should include information in the report on instrument flight rule operations and ASR-9 radars located at airports that had fewer total air traffic operations than the Cherry Capital Airport in 1996. Specifically, the agencies noted that instrument flight rule operations may be a better indicator of the need for a radar at airports than total air traffic operations

and, thus, could have an impact on the results of benefit-cost studies. In addition, they commented that some airports that currently have ASR-9 surveillance radars, which were installed in the 1980s, also had fewer total air traffic operations than the Cherry Capital Airport did in 1996. Although the Federal Aviation Administration currently has no plans to replace these radars, the agencies noted that the equipment will need to be replaced over the next 10 years. The Federal Aviation Administration reiterated that the results of benefit-cost studies also could be used to revalidate the operational needs for the radars before they are replaced. However, the agency has no plans to conduct such studies for these airports. In response to the agencies' comments, we included more detailed information about the airports that currently have ASR-9 radars in appendix I and information about airports' instrument flight rule operations in appendix II. The agencies also suggested several changes to improve the accuracy and clarity of the report that we incorporated where appropriate.

Scope and Methodology

We performed audit work at FAA's headquarters in Washington, D.C.; the Great Lakes Regional Office in Chicago; the Air Route Traffic Control Center in Minneapolis; and the Cherry Capital Airport in Traverse City, Michigan. To determine what process FAA currently has in place for determining which airports that do not have radars may be eligible for surveillance radars, we interviewed officials at FAA's headquarters, regional, and airport offices; and reviewed and analyzed pertinent FAA criteria, regulations, procedural, and other guidance documents.

To identify the factors FAA considered when conducting the 1994, 1996, and 1997 benefit-cost studies, we analyzed the studies and supporting documents, FAA's Investment Criteria for Airport Surveillance Radar, dated May 1983, and other guidance documents for conducting such studies. We interviewed FAA headquarters officials currently responsible for conducting benefit-cost studies. We also obtained information on the factors FAA considered when developing air traffic projections, analyzed the projections, and compared actual and projected air traffic operations. In addition, we interviewed representatives of local planning and public interest groups located in the Traverse City area that were familiar with the Cherry Capital Airport's air traffic operations to obtain information on past and anticipated air traffic growth, the need for a surveillance radar, and the safety concerns at the airport.

To determine the impact other air traffic projections would have had on the results of FAA's 1997 benefit-cost study, we interviewed FAA officials and controllers working at the Cherry Capital Airport, officials of the Michigan Department of Transportation and the Traverse City Planning Commission, and representatives of two aviation consulting firms. We obtained air traffic projections from the consulting firms and had FAA headquarters officials conduct sensitivity analyses using the projections. Although we evaluated what impact the projections would have had on the results of the 1997 study, we did not evaluate the methodologies used by the consulting firms to develop their projections because this was not part of the scope of our review.

To determine what actions FAA has taken to address the safety concerns raised by Members of Congress, air traffic controllers, and local citizens, we obtained information on the operational capabilities of the TARDIS and on how the equipment is intended to be used through interviews with FAA headquarters and regional officials, the Cherry Capital controllers, and airport officials.

In addition, we collected data from FAA that identified the airports with fewer total air traffic operations than the Cherry Capital Airport in 1996 that are scheduled to receive replacement surveillance radars. We discussed with FAA headquarters officials the rationales for initially installing surveillance radars at the airports and when the existing radars are scheduled to be replaced. However, we did not contact representatives at the airports to verify the information provided by FAA headquarters officials. We also obtained data on airports that currently have ASR-9 radars and fewer total air traffic operations than the Cherry Capital Airport.

We performed our review from October 1997 through May 1998 in accordance with generally accepted government auditing standards.

We are providing copies of this report to interested congressional committees; the Secretary of Transportation; the Administrator, FAA; and the Members of Congress representing the Traverse City area. We will also make copies available to others on request. If you or your staff have

any questions or need additional information about this report, please call me at (202) 512-2834. Major contributors to this report are listed in appendix III.

John H. Anderson, Jr.
Director, Transportation Issues

Contents

Abbreviations

ASR	airport surveillance radar
FAA	Federal Aviation Administration
TARDIS	Terminal Automated Radar Display and Information System

Airports With ASR-9 Radars That Had Fewer Total Air Traffic Operations in 1996 Than the Cherry Capital Airport

		Operations in 1996		
		Total[a]	Total instrument[b]	FAA's rationale for installing the radar
	Cherry Capital (Traverse City, MI)	128,419	27,594	[c]
1	Nantucket Memorial (Nantucket, MA)	128,289	45,299	— Congressional mandate in 1988
2	Theodore Francis Green State (Providence, RI)	119,355	259,480	— Former military installation
3	Stewart International (Newburgh, NY)	117,366	36,151	— Provides support for military training — Air route traffic control center does not have adequate coverage of the airspace
4	Portland International (Portland, ME)	115,032	132,210	— Provides support for Air Force and Navy operations — Provides coverage and services for numerous satellite airports
5	Spokane International (Spokane, WA)	114,767	172,448	— Former military installation — Provides coverage in mountainous terrain
6	Atlantic City International (Atlantic City, NJ)	111,127	149,953	— Supports FAA Technical Center — Provides support for the Department of Defense Air Defense Squadron — Provides support for FAA flight testing
7	Toledo Express (Toledo, OH)	109,059	179,409	— Provides support to the Toledo industrial district
8	Grant County (Moses Lake, WA)	106,154	30,777	— Congressional interest[d]
9	Fort Wayne International (Fort Wayne, IN)	99,335	149,124	— Congressional interest
10	Roswell Industrial Air Center (Roswell, NM)	95,426	24,925	— Congressional mandate in 1991
11	Gainesville Regional (Gainesville, FL)	87,524	28,809	— Congressional mandate in 1988
12	Charlottesville-Albermarle (Charlottesville, VA)	80,697	27,774	— Congressional mandate in 1988
13	Cedar Rapids Municipal (Cedar Rapids, IA)	78,964	102,364	— Provides support for air freight operations for northeast Iowa — Alternate base for the Des Moines Air National Guard — Provides support for Rockwell Collins Avionics Manufacturing
14	Harrisburg International (Harrisburg, PA)	78,161	183,124	— Provides coverage and services in challenging terrain environment

(continued)

		Operations in 1996		
		Total[a]	Total instrument[b]	FAA's rationale for installing the radar
15	Walker Field (Grand Junction, CO)	77,275	19,508	— Congressional mandate in 1992
16	Yakima Air Terminal (Yakima, WA)	73,968	22,995	— Congressional interest
17	Huntsville International-Carl T. Jones Field (Huntsville, AL)	73,399	101,868	— Provides services to pilot training facility — Air route traffic control center does not have adequate coverage of airspace
18	Mathis Field (San Angelo, TX)	72,279	24,222	— Congressional interest
19	Rogue Valley International (Medford, OR)	68,891	21,824	— Congressional interest
20	Tri-Cities (Pasco, WA)	68,452	80,355	— Provides coverage in mountainous terrain
21	Rio Grande Valley International (Brownsville, TX)	60,088	30,422	— Provides coverage for the Rio Grande Valley for air carrier services provided to three airports — Radar signal is remoted to the terminal radar approach control facility in Corpus Christi
22	Lynchburg Regional-Preston Glenn Field (Lynchburg, VA)	52,129	19,903	— Congressional mandate in 1991 — Radar signal will be remoted to the terminal radar approach control facility in Roanoke, VA
23	Fayetteville Regional/Grannis (Fayetteville, NC)	47,417	180,897	— Provides support for military operations — Provides tower air route traffic control services
24	Missoula International (Missoula, MT)	46,714	15,444	— Congressional mandate in 1988
25	Drake Field (Fayetteville, AR)	44,283	31,781	— Congressional interest
26	Columbia Regional (Columbia, MO)	41,353	13,509	— Congressional interest
27	Eastern West Virginia Regional-Shepard Field (Martinsburg, WV)	[e]	[e]	— Congressional mandate in 1991 — Radar signal will be remoted to the terminal radar approach control facility at Dulles International Airport

(Table notes on next page)

[a]Total operations are the number of takeoffs and landings by different types of aircraft, such as commercial air carriers, commuter, and general aviation, at the airports. For example, the Cherry Capital Airport is mainly a general aviation airport, whereas some of the other airports have more air carrier and commuter air traffic.

[b]Total instrument operations are the number of aircraft that passed through the airports' airspace in addition to aircraft approaching and departing the airports themselves. Hence, total instrument operations may exceed total airport operations because some airports provide radar coverage to satellite airports.

[c]Not applicable.

[d]The term "congressional interest" does not necessarily refer to radars installed as a result of congressional mandates.

[e]Not available.

Source: FAA.

Airports With Fewer Total Air Traffic Operations in 1996 Than the Cherry Capital Airport That Have ASR-7 and ASR-8 Radars Scheduled for Replacement

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
	Cherry Capital (Traverse City, MI)	128,419	27,594	[d]	[d]
1	Bishop International (Flint, MI)	125,957	112,128	— Alternate or reliever airport for Detroit Metropolitan Airport — Provides services to corporate travelers, including General Motors	Jan. 2003
2	Pensacola Regional (Pensacola, FL)	121,576	95,709	— Provides coverage and services for a large naval flight training center	Apr. 2005
3	Reading Regional/ Spaatz Field (Reading, PA)	120,535	54,398	— Congressional interest[e] — Radar was installed after an accident	July 2004
4	Fairbanks International (Fairbanks, AK)	119,455	50,625	— Provides coverage and services for a military base — Former Air Force base	Oct. 2001
5	Mobile Regional (Mobile, AL)	117,774	147,203	— Provides coverage and services for a military base — Former Air Force base	Mar. 2003
6	Lincoln Municipal (Lincoln, NE)	115,103	99,646	— Previously provided approach control services for the Department of Defense's Strategic Air Command Base	Apr. 2001
7	Capital City (Lansing, MI)	114,532	165,022	— State capital	Aug. 2001
8	Mahlon Sweet Field (Eugene, OR)	112,898	95,937	— Provides coverage and services in mountainous terrain — Flight school at airport — Provides services to numerous satellite airports — Low-visibility airport during winter months	Dec. 2003

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
9	Tallahassee Regional (Tallahassee, FL)	111,018	124,373	— Congressional interest — State capital	Jan. 2004
10	Burlington International (Burlington, VT)	110,646	110,172	— Provides coverage and services to the Air National Guard and military bases	Sept. 2001
11	Gulfport-Biloxi Regional (Gulfport, MS)	110,441	104,411	— Provides coverage and services to the Air National Guard and services for military bases	Oct. 2003
12	Springfield-Branson Regional (Springfield, MO)	108,246	95,129	— Air route traffic control center does not have adequate coverage of the airspace — Formerly a hub for Ozark Airlines	Nov. 2001
13	Columbia Metropolitan (Columbia, SC)	107,107	139,058	— Provides coverage and services to Air National Guard base — Airport has capability to provide air route traffic control services	Mar. 2002
14	Akron-Canton Regional (Akron, OH)	103,798	171,135	— Congressional interest — Provides services to corporate travelers, including Goodyear Corporation and Timkin Roller Bearing	July 2001
15	Kalamazoo/Battle Creek International (Kalamazoo, MI)	103,376	123,894	— Air National Guard base	May 2003
16	Capital (Springfield, IL)	102,851	118,638	— Congressional interest — State capital	July 2002

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
17	Greater Rockford (Rockford, IL)	101,727	161,041	— Provides coverage and services for the Camp Grant military base — Provided services for military training flights because Chicago O'Hare could not accommodate these aircraft -A hub for United Parcel Service	June 2003
18	Roanoke Regional/ Woodrum Field (Roanoke, VA)	101,427	93,875	— Provides coverage in mountainous terrain — Air route traffic control center does not have adequate coverage of the airspace	May 2001
19	Billings Logan International (Billings, MT)	101,420	80,435	— Provides coverage in mountainous terrain — No long-range surveillance radar coverage available	June 2001
20	Midland International (Midland, TX)	95,992	148,181	— Provides coverage and services for military training	Dec. 2002
21	Savannah International (Savannah, GA)	95,472	147,046	— Former military base	Nov. 2002
22	Monterey Peninsula (Monterey, CA)	95,140	132,296	— Former military base	Jan. 2005
23	Blue Grass (Lexington, KY)	94,166	118,464	— Provides coverage to four satellite airports	Dec. 2002
24	Youngstown Warren Regional (Youngstown/ Warren, OH)	93,588	116,606	— Congressional interest — Provides coverage and services for the Air Force Reserves	Nov. 2002
25	Palm Springs Regional (Palm Springs, CA)	93,584	131,226	— Congressional interest — Provides coverage in mountainous terrain	Nov. 2004

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
26	Abilene Regional (Abilene, TX)	92,710	129,373	— Provides coverage and services to the largest B1 bomber base — Provides services to five satellite airports	May 2002
27	Lafayette Regional (Layfayette, LA)	91,250	119,582	— Provides coverage and services for military practice approaches — Provides services to satellite airports — Provides services to the largest civil fleet of helicopters	Oct. 2001
28	Hilo International (Hilo, HI)	90,024	27,441	— Alternate airport for Honolulu — Island with highest terrain; heavy rainfall area, limited visibility — Stopover for flights to and from Australia and New Zealand	June 2004
29	Bangor International (Bangor, ME)	89,960	97,804	— Stopover airport for flights from Europe — Alternate airport for Boston Logan International	May 2001
30	Joe Foss Field (Sioux Falls, SD)	89,481	61,011	— Air National Guard fighter wing — Minihub for air cargo operations — Largest city in South Dakota	Nov. 2003
31	Lovell Field (Chattanooga, TN)	88,567	105,312	— Provides services to 10 satellite airports	Apr. 2004
32	Yeager (Charleston, WV)	88,546	111,601	— Congressional interest — Provides services to satellite airports	Aug. 2002
33	Stockton Metropolitan (Stockton, CA)	83,759	144,338	— FAA takeover of a Department of Defense site	June 1999
34	Jackson International (Jackson, MS)	83,651	120,448	— Radar installed when new airport was built in 1963 to cover growth in general aviation, military, and air carrier traffic	June 2003

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
35	Amarillo International (Amarillo, TX)	83,516	93,312	— Provides coverage and services to the military — Previously provided approach control services to the Department of Defense's Strategic Air Command base	Apr. 2003
36	Evansville Regional (Evansville, IN)	82,665	115,713	— Provides services to 12 satellite airports — Provides coverage and services to 100 scheduled air carriers daily	Sept. 2002
37	Hector International (Fargo, ND)	82,328	66,418	— Only airport with primary radar within 120 miles — Provides services to the Air National Guard	Apr. 2002
38	Cyril E. King (Charlotte Amalie, VI)	81,259	28,009	— Provides coverage for a combined air traffic control center and terminal radar approach control facility in San Juan, PR	Sept. 2004
39	Michina Regional Transportation Center (South Bend, IN)	80,442	142,492	— Provides services to 18 satellite airports — Alternate airport for Chicago O'Hare — Provides overflight services to and from Chicago O'Hare	Aug. 2003
40	Pueblo Memorial (Pueblo, CO)	77,564	30,655	— Possible congressional mandate; however, no documentation available — Provides support for surrounding restricted military area activities	May 2002
41	Greater Peoria Regional (Peoria, IL)	73,629	142,829	— Provides services to four satellite airports	Jan. 2002

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
42	Tri-Cities Regional TN/VA (Bristol/Johnson/ Kingsport, TN)	73,030	96,664	— Congressional interest — Provides coverage in mountainous terrain — Moody Aviation trains bush pilots for missionary work	Feb. 2002
43	Monroe Regional (Monroe, LA)	72,574	98,891	— Provides services to 10 satellite airports — Air route traffic control center does not have adequate coverage of the airspace	Mar. 2003
44	Gregg County (Longview, TX)	70,702	95,204	— Provides coverage for Longview and Tyler, TX, airports — Provides services for oil industry business jet air traffic	Sept. 2003
45	Quad-City (Moline, IL)	70,500	102,407	— Provides service to corporate travelers, including John Deere Corporation	Aug. 2002
46	Muskegon County (Muskegon, MI)	69,538	89,808	— Provides support for air taxi and military approaches	Feb. 2002
47	Asheville Regional (Asheville, NC)	68,560	103,273	— Provides coverage in mountainous terrain	Jan. 2004
48	Fort Smith Regional (Fort Smith, AR)	68,008	221,673	— Provides coverage and services to an Air National Guard base — Provides approach control services for northwest Arkansas, including Fayetteville, AR	June 2001
49	New Hanover International (Wilmington, NC)	67,640	102,754	— Provides services to four satellite airports and to military air traffic	July 2002

(continued)

Appendix II
Airports With Fewer Total Air Traffic Operations in 1996 Than the Cherry Capital Airport That Have ASR-7 and ASR-8 Radars Scheduled for Replacement

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
50	Elmira/Corning Regional (Elmira, NY)	64,222	69,160	— Provides coverage in mountainous terrain — Provides services to satellite airports — Previously provided approach control services to the Seneca Army Air Depot	Aug. 2003
51	Austin Straubel International (Green Bay, WI)	64,042	120,557	— Provides services to nine satellite airports — Third-largest approach control facility and fourth-busiest airport in the state	Oct. 2002
52	Duluth International (Duluth, MN)	60,340	38,208	— Provides coverage and services to the Air National Guard — Provides coverage and services to overflow and diverted traffic from Minneapolis — Previously provided services to two Air Force base squadrons	Mar. 2004
53	Greenville-Spartanburg (Greer, SC)	59,371	150,139	— Congressional interest	Mar. 2002
54	Sioux Gateway (Sioux City, IA)	58,006	41,376	— Provides coverage and services to the Air National Guard and four satellite airports	June 2004
55	Benedum (Clarksburg, WV)	57,524	51,607	— Congressional interest	Dec. 2003

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
56	Rochester International (Rochester, MN)	57,149	38,167	— Provides services for the Mayo Clinic, including lifeguard flights — Alternate airport for Minneapolis airport — Airport has one of the few Global Positioning System Heliport instrument approaches — Provides services for large cargo operations	Apr. 2004
57	Waterloo Municipal (Waterloo, IA)	56,476	48,589	— Provides services to the Air National Guard and satellite airports — Provides tower air route traffic control services	Apr. 2003
58	Columbus Metropolitan (Columbus, GA)	56,372	106,848	— Provides coverage and services to Fort Benning Military Base — Provides services to 19 satellite airports — Sequences turboprops and props into Atlanta Hartsfield	Aug. 2004
59	Wilkes Barre/ Scranton International (Wilkes Barre/Scranton, PA)	56,262	93,831	— Congressional interest	Mar. 2004
60	Great Falls International (Great Falls, MT)	53,996	48,994	— Provides coverage and services to the Air National Guard — Provides coverage for detecting and interdicting aircraft involved in illegal drug activities	Sept. 2002
61	Myrtle Beach International (Myrtle Beach, SC)	52,637	82,573	— FAA takeover of a Department of Defense site — Provides services for military practice approaches	Apr. 2002

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
62	Bismarck Municipal (Bismarck, ND)	52,451	29,169	— Congressional interest — State capital — Provides services to three satellite airports — Provides coverage and services to the Air National Guard	May 2004
63	Tri-City International (Saginaw, MI)	51,498	93,755	— Provides services in restricted military airspace — Provides coverage for air carrier and air taxi operations	Jan. 2003
64	Erie International (Erie, PA)	49,892	90,664	— Provides coverage in mountainous terrain — Provides service to three satellite airports	Aug. 2001
65	Waco Regional (Waco, TX)	49,803	76,082	— Part of the Dallas-Fort Worth Metroplex — Provides air traffic relief services to an air route traffic control center	Dec. 2001
66	Hulman Regional (Terre Haute, IN)	49,548	94,353	— Provides coverage and services to the Air National Guard — Indiana State University student pilot training — Midnight freight operations	Oct. 2003
67	Jefferson County (Beaumont/Port Arthur, TX)	44,362	63,166	— Fills radar coverage gap for terminal radar approach control in Houston	Feb. 2004
68	Natrona County International (Casper, WY)	43,396	18,411	— Congressional interest — Provides services for oil industry related air traffic — Provides coverage in mountainous terrain	May 2004
69	Binghamton Regional (Binghamton, NY)	43,343	63,842	— Provides coverage in mountainous terrain	July 2003

(continued)

		Operations in 1996		FAA's rationale for installing the radar	Scheduled date for installing radar[c]
		Total[a]	Total instrument[b]		
70	Lake Charles Regional (Lake Charles, LA)	42,863	68,049	— Department of Defense's Air Defense Identification Zone — Military practice approaches conducted at the airport	July 2003
71	Bush Field (Augusta, GA)	42,054	74,672	— Host of Master's Tournament — Supports increasing corporate air traffic	Oct. 2002
72	Middle Georgia Regional (Macon, GA)	41,343	135,527	— Provides coverage and approach control services for Middle Georgia Regional and Robbins Air Force Base — Provides coverage and services for the military	July 2004
73	Mansfield Lahm Municipal (Mansfield, OH)	39,618	56,150	— Congressional interest — Provides coverage and services for the local Air National Guard	Feb. 2004
74	Tri-State (Huntington, WV)	38,786	79,139	— Congressional interest	Sept. 2003
75	Florence Regional (Florence, SC)	34,337	69,170	— Congressional interest	Feb. 2003

[a]Total operations are the number of takeoffs and landings performed by the mix of aircraft, such as commercial air carriers, commuter, and general aviation, using the airports. For example, the Cherry Capital Airport is mainly a general aviation airport, whereas some of the other airports have more air carrier and commuter air traffic.

[b]Total instrument operations are the number of aircraft that passed through the airports' airspace in addition to aircraft approaching and departing the airports themselves. Hence, total instrument operations may exceed total airport operations because some airports provide radar coverage to satellite airports.

[c]These are the scheduled installation dates as of February 1998.

[d]Not applicable.

[e]The term "congressional interest" does not necessarily refer to radars installed as a result of congressional mandates.

Source: FAA.

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