REVIEW OF FAA'S FINAL MONITOR AID TOOL AT DENVER'S TERMINAL RADAR APPROACH CONTROL CENTER

Federal Aviation Administration

Report Number AV-2008-022

Date Issued: January 25, 2008

Memorandum

Subject: <u>ACTION</u>: Review of FAA's Final Monitor Aid Tool at Denver's Terminal Radar Approach Control Center
Federal Aviation Administration
Report Number AV-2008-022

Date: January 25, 2008

From: Lou Dixon
Assistant Inspector General for
 Aviation and Special Program Audits

Reply to
Attn. of: JA-10

To: Acting Federal Aviation Administrator

This report presents the results of our review of the safety and suitability of the Federal Aviation Administration's (FAA) Final Monitor Aid (FMA) tool deployed at Denver's Terminal Radar Approach Control Center (TRACON). We initiated our review in response to a hotline complaint. Our objective was to determine if the FMA at the Denver TRACON is safe, effective, and suitable for managing air traffic. The exhibit to this report details our review scope and methodology.

FMA allows Denver's air traffic controllers to visualize and precisely manage aircraft on triple, simultaneous, final approaches to the airport's parallel runways during low-visibility conditions. Without FMA, triple, parallel approaches at Denver are prohibited when visibility is limited, and the maximum aircraft acceptance rate into the airport is reduced by 33 percent—from 96 aircraft landings per hour to just 64 per hour.

The FMA tool at the Denver TRACON runs on a Standard Terminal Automation Replacement System (STARS) computer and display. To receive flight and radar data, the STARS FMA system requires STARS hardware to be connected in a hybrid configuration to Denver's existing terminal automation system, the Common Automated Radar Terminal System (CARTS).

BACKGROUND

During 2006 and early 2007, the STARS FMA system was tested at the Denver TRACON. Based on those tests, Denver officials concluded that the system was safe. The system was subsequently commissioned on February 28, 2007, concluding a lengthy installation and testing process.

In 1996, STARS was the centerpiece of the Agency's nationwide terminal automation modernization effort. However, FAA did not complete the nationwide STARS deployment primarily because of affordability concerns. Recognizing these concerns, we recommended in 2004 that FAA focus on replacing aging controller displays at Denver and three other large TRACONs and upgrading existing CARTS systems instead of deploying STARS.[1] As we noted in congressional testimony, replacing the aging displays is the most urgent issue facing terminal modernization.[2]

Subsequently, FAA decided to retain CARTS and is scheduled to replace aging displays in Denver in 2008. Once the new displays are installed on CARTS in 2008, CARTS could be upgraded with FMA software. Once that upgrade is complete, there will be no benefit to keeping the STARS FMA workstations—from both an operational and a maintenance perspective.

RESULTS IN BRIEF

We found no evidence that Denver's new STARS FMA system, as currently configured and operating, is unsafe. It appears to be effectively performing the role for which it was designed. However, Denver's STARS FMA solution requires two complete terminal automation systems, STARS and CARTS, to do the job of one.

During testing in 2006, Denver's STARS FMA system experienced problems related to its hybrid configuration that raised legitimate safety questions. While those safety issues were resolved, FAA's use of two complete automation systems to provide Denver with FMA capability raises questions about the suitability and cost-effectiveness of the STARS FMA configuration compared with a single-system approach. For instance, annual TRACON maintenance costs for STARS FMA in 2006 were about $100,000, or over 12 times more than the approximately $8,100 spent maintaining Denver's legacy FMA system.

---

[1] OIG Report Number AV-2005-016, "Terminal Modernization: FAA Needs To Address Its Small, Medium, and Large Sites Based on Cost, Time, and Capability," November 23, 2004. OIG reports and testimonies are available on our website: www.oig.dot.gov.

[2] OIG Testimony Number CC-2007-047, "Actions Needed To Reduce Risk With the Next Generation Air Transportation System," May 9, 2007.

In 2008, FAA will install new controller displays and upgrade the CARTS automation system at Denver. These new displays will be able to present FMA radar and flight data to controllers, without using STARS. Therefore, when installing the new displays in Denver, FAA needs to determine whether it is more cost-effective to maintain both STARS and CARTS or integrate FMA software into one automation system. FAA should then implement the most suitable and cost-effective means of providing FMA capability at Denver and other locations.

FINDINGS

Denver's STARS FMA Is Safe but Requires Two Complete Automation Systems To Provide FMA Capability

CARTS and STARS are two completely different automation systems, developed by two different vendors. Because CARTS and STARS are separate systems, FAA had to develop a unique software interface to allow the two systems to exchange critical radar and flight data. However, this interface is so complex and sensitive that a disruption on the CARTS side can cause the loss of all critical flight data on the STARS FMA side.

For example, on October 4, 2006, all critical flight data were lost from Denver's STARS FMA displays during testing. This incident raised legitimate safety questions about the STARS FMA system, which was removed from testing for analysis. FAA subsequently developed a software interface patch, and the system re-entered testing on November 1, 2006. According to Denver TRACON officials, no additional malfunctions have occurred since testing resumed.

After the STARS FMA system re-entered testing, we visited the Denver TRACON and watched the system operate. We interviewed local air traffic controllers, managers, and maintenance and technical personnel and found no evidence to indicate that the STARS FMA system is unsafe. The personnel we interviewed all generally supported the view that FMA on STARS appears to operate safely and perform the task for which it was designed.

FAA Needs To Consider a More Integrated Approach To Deliver the FMA Capability at Denver

The Denver TRACON relies on two systems to provide FMA services. However, this creates a complex configuration, which may not be the most suitable or cost-effective way to obtain FMA capabilities. This configuration requires air traffic controllers to be trained on both CARTS and STARS and FAA maintenance technicians to support both systems.

Maintaining a complete STARS automation system for the sole purpose of providing FMA also adds additional costs to the Denver TRACON's operations. In 2006, annual maintenance costs for STARS at Denver were about $100,000 versus only about $8,100 to support the legacy FMA system—an increase of more than 12 times. Further, although STARS at Denver is a complete radar automation system with associated STARS-only displays, Denver limits STARS to one role: enabling FMA. The Denver TRACON does not utilize any other STARS features. FAA personnel estimate that the FMA capability uses less than 5 percent of STARS capabilities.

Instead of operating and maintaining two systems to provide FMA at Denver, FAA could simplify its approach by integrating FMA software directly into the CARTS automation system after replacing the aging CARTS displays in 2008. An integrated FMA approach for CARTS is feasible; it was prototyped and demonstrated to FAA officials in 2002. An integrated approach would also reduce costs for training controllers and maintenance support. Lastly, adopting an integrated FMA approach would eliminate the cost of separate STARS hardware and STARS-only displays, the connecting software interface from CARTS to STARS, and the cost to operate and support two systems.

We discussed a CARTS integrated FMA approach with FAA's Terminal Automation Program Office. The program manager was familiar with the integrated approach. He acknowledged that after the plan to fully deploy STARS changed, the unique situation at the Denver TRACON created a less efficient maintenance condition. The program manager also agreed that integrating the FMA capability into a single system would be technically feasible once the aging displays in Denver are replaced in 2008.

Since those discussions, the program office began a cost-benefit analysis to determine if it would be cost-effective to integrate FMA into a single automation system after the aging displays are replaced in 2008. The cost-benefit analysis is not yet complete. The estimated cost to integrate FMA into multiple air traffic control facilities using CARTS, including Denver, is $2 million. However, FAA anticipates that this cost will be offset by the benefit of having to maintain only one terminal automation system that also provides FMA capability.

RECOMMENDATIONS

We recommend that FAA determine whether it is more cost-effective to maintain both STARS and CARTS in Denver or integrate FMA software into one system once Denver's aging displays are replaced in 2008. After taking this action, FAA needs to implement the most cost-effective means of providing FMA capability at Denver and other air traffic control facilities where FMA capability is justified.

AGENCY COMMENTS AND OFFICE OF INSPECTOR GENERAL RESPONSE

We discussed the results of our work with FAA managers at the Denver TRACON and the Terminal Automation Program Office at the Agency's Headquarters in Washington, D.C. We also provided them with a discussion draft in December 2007 and incorporated their comments where appropriate. FAA Headquarters and field office managers concurred with our findings, conclusions, and recommendations. They pointed out that actions are underway (an ongoing cost-benefit analysis) to address our concerns. We believe that management attention will be needed to ensure follow-through by the Agency to identify and select the most cost-effective approach for providing FMA at Denver and other facilities.

ACTIONS REQUIRED

In accordance with DOT Order 8000.1C, we request that FAA formally respond to our recommendation within 30 calendar days. We are requesting that FAA provide us with target completion dates for completing the cost-benefit analysis and implementing the most cost-effective approach for providing FMA. FAA may propose alternative actions that it believes would resolve the issues presented in this report.

We appreciate the courtesies and cooperation of FAA representatives during this review. If you have any questions or concerns about this report, please contact Matthew E. Hampton, Deputy Assistant Inspector General for Aviation and Special Program Audits, at 202-366-1987.

#

cc: Anthony Williams, ABU-100
     Martin Gertel, M-1

EXHIBIT. SCOPE AND METHODOLOGY

To accomplish our objective, we interviewed FAA managers from the Denver TRACON at the Northwest Mountain Regional Office in Renton, Washington. We reviewed FAA documents and records related to the Denver FMA system and its automation platform, STARS, as well as FMA operation, performance, and maintenance history.

We visited the Denver facility and observed STARS FMA operations. We interviewed air traffic control and operational support personnel familiar with STARS and Denver's existing automation system, CARTS. We also discussed the STARS FMA and CARTS systems with an FAA Headquarters official from the terminal automation program office responsible for managing the acquisition and installation of air traffic control equipment. We discussed Denver's future replacement displays with a representative of FAA's display contractor. We conducted this review between December 2006 and November 2007 in accordance with generally accepted Government Auditing Standards prescribed by the Comptroller General of the United States.