



Memorandum


U.S. Department of
Transportation

Office of the Secretary
of Transportation

Office of Inspector General

Subject: ACTION: Follow-Up on Federal Aviation Administration's Acquisition of Standard Terminal Automation Replacement System

Date: June 3, 2002

From: Inspector General  Reply To: JA-10:x60500
Attn. Of:

To: Federal Aviation Administrator

This memorandum addresses three matters concerning the Federal Aviation Administration's (FAA) Standard Terminal Automation Replacement System (STARS). First, we want to reaffirm the number of open critical trouble reports as of March 7, 2002, a subject discussed at a March 13, 2002 FAA appropriation hearing, and express our concern that FAA officials have stated the agency will leave unresolved and unfixed an unspecified number of "critical" trouble reports before deploying STARS to Philadelphia in November 2002. The criteria for distinguishing which "critical" trouble reports will be fixed is unclear and vague, especially so for an air traffic control system.

Second, to meet the November date, FAA has accelerated some steps and deferred others. Site adaptation, an important development step, has been accelerated and we endorse this decision. However, FAA has deferred independent testing until after the November deployment. This testing is intended to provide assurance that the product is suitable for real world use.

Third, in our opinion, FAA should take this opportunity to clarify explicitly what the expectations are for STARS when it is deployed to Philadelphia, given that independent testing was deferred, and an unspecified number of open critical trouble reports will not have been fixed by the time STARS is deployed at Philadelphia. This point is important because we understood that FAA's objective was that STARS would replace the existing system and be operational in November 2002 with controllers relying on STARS to control live traffic.

RESULTS

STARS is an important modernization effort because it will replace controller displays and related computer equipment at over 160 air traffic control facilities. Over the years, STARS has experienced cost increases and schedule slips. This effort will now cost at least \$1.7 billion, an 80 percent increase over the initial estimate of \$940 million. STARS was originally scheduled to begin national deployment in December 1998. In September 2001, FAA stated that its objective was to place a nationally deployable version of STARS (“Full STARS”) at Philadelphia that was safe, effective, and suitable in November 2002.¹ This date is now only 5 months away.

While discussing STARS at a March 13, 2002 hearing on FAA’s budget before the Transportation Subcommittee of the House Appropriations Committee, there was confusion about the number of open critical trouble reports in the STARS program. Trouble reports are the vehicle for correcting deficiencies observed during testing and operation of hardware and software. Established FAA procedures identify a trouble report as closed after a fix for a deficiency has been identified, documented, verified, and validated. “Critical” open trouble reports are those that would prevent or preclude the performance of a mission, jeopardize safety or security, or adversely affect a mission-essential capability.

During the March hearing, we testified that there were *258 open critical trouble reports* for the STARS program. This number had grown from 175 in September 2001 to 258 in March 2002. In contrast, FAA indicated that there were less than 50 open critical trouble reports at the time of the hearing. In reconciling these numbers, we reviewed the facts and stand by our testimony that there were 258 open critical trouble reports.² FAA’s own documents show that this statement was accurate, as demonstrated in the following table, which is an extract from FAA’s STARS Biweekly Report for March 7, 2002.

Open STARS Critical Trouble Reports

Software Build*	Type 1 Critical	Type 2 Critical	Type 3 and 4 Test Critical	Total Critical Trouble Reports
Full STARS-1	33	44	4	81
Full STARS-2/2+	38	113	26	177
TOTALS	72	159	37	258

* STARS uses a building block approach. Completion of each STARS version -- Full STARS-1 and Full STARS 2/2+ -- is necessary to achieve a fully-functional STARS capability.

¹ FAA testimony before the House Committee on Transportation and Infrastructure, Subcommittee on Aviation, Sept. 13, 2001.

² A type 1 critical trouble report prevents or precludes the performance of an operational or mission essential capability as specified by system requirements, or jeopardizes safety or security. A type 2 critical report adversely affects but does not preclude the performance of an operational, mission essential, or key support capability as specified by system requirements so as to degrade performance, and a workaround solution is not available. A type 3 or 4 test critical report substantially impacts ability to conduct a test successfully.

As part of our follow-up review, we met with FAA officials responsible for managing STARS. They neither disputed that 258 critical trouble reports were open, nor provided a point of reference for the “less than 50” open critical trouble reports referred to in FAA’s testimony. However, these officials did tell us that FAA’s current strategy is to meet the November 2002 date by focusing attention on the highest priority trouble reports, which they characterize as “truly critical” or “potential show-stoppers.” They further stated that this approach will allow FAA to meet the schedule and commence STARS operations in November with a product that is “not perfect but acceptable.”

Based on what program officials now tell us about FAA’s intentions, we are concerned with the inexactitude and ambiguity inherent in the “not perfect but acceptable” standard, as well as the implications it may have for air traffic controllers and maintenance technicians. Our concerns are based on the following.

First, in an effort to meet the November date, we understand FAA will leave unresolved and unfixed an unspecified number of critical trouble reports. As of May 2, there were 221 open critical trouble reports. The FAA program office is now distinguishing between trouble reports it classifies as critical, which will not necessarily be fixed, and those that it considers “truly critical” that will be fixed. The criteria for making the distinction between “critical” and “truly critical” hardware and software problems is not self-defining and is vague, especially for an air traffic control system.

To illustrate, 1 of the 221 open critical trouble reports pertains to the time it takes to repair STARS computer processors. The specifications and contract state that the repair must be accomplished in 30 minutes. However, the actual repair time is between 90 minutes and 3 hours, which can be a significant period to rely on back-up systems when controlling traffic. To date, FAA has been unable to resolve this issue, and it is not clear whether FAA will allow this situation to go uncorrected at Philadelphia as it begins to control air traffic.

Second, again in an attempt to meet the November date, FAA has accelerated some steps and deferred others. An important development step, site adaptation, has been accelerated, and we endorse this decision. In contrast, FAA has deferred Independent Operational Test and Evaluation (independent testing). Independent testing provides the final assurance that the product is safe, effective and suitable for full-time use in the real world. We have serious reservations about declaring STARS “operational” before FAA satisfactorily completes its standard Independent Operational Test and Evaluation.

Site adaptation is the work required to customize STARS for the airspace surrounding Philadelphia. This work can be tedious and time-consuming. The STARS contractor, Raytheon, agrees that tailoring STARS for Philadelphia is a significant undertaking

and should not be underestimated. While accelerating this step is a good idea, much work remains, such as integrating STARS with multiple radars and remote towers.

The deferral of independent testing concerns us. During development of software-intensive systems like STARS, software glitches can manifest themselves in different ways, and only reveal themselves during rigorous testing. FAA requires that a new system be tested in a laboratory environment before a system is placed into an operational environment. FAA is currently doing this with STARS at its Atlantic City Technical Center. Normally, after laboratory testing, the system is installed at a site with low to medium air traffic volume to demonstrate its capability in a real world environment, and undergoes independent testing.

Independent testing for the Philadelphia STARS version was scheduled to commence in Memphis in August 2002 and be completed before STARS became operational in Philadelphia, a high volume air traffic facility. This would have allowed FAA to correct any glitches found in testing before deploying the national system, Full STARS, to Philadelphia. However, because of delays in development, FAA did not install Full STARS at Memphis and, hence, did not conduct independent testing as planned. Instead, FAA is deferring independent testing until after installing Full STARS at Philadelphia.

Third, in order to stay on schedule for Philadelphia, the contractor increased monthly spending (the “burn rate”) in fiscal year 2002 to an unsustainable level. According to the STARS contracting officer, FAA has been spending about \$10 million per month on average this year on the STARS contract. This is an increase from a monthly average of \$8 million to \$9 million in the 3 prior fiscal years. FAA is in the process of negotiating a revised spending plan with its contractor to reduce the current burn rate. At this point, it is unclear what trade-offs, if any, will be made to stay on schedule given the funding situation.

In closing, we note that in September 2001, FAA stated that it would commence STARS operations in Philadelphia in November 2002 “with a safe, operationally effective, and operationally suitable service.” We understood this to mean that STARS would be operational by that date with Philadelphia facility controllers relying exclusively on STARS to control live air traffic, and not relying on the Automated Radar Terminal System (ARTS), which is the current system that STARS is intended to replace.

We have little doubt that STARS hardware and software can be “installed” by November, but, in our opinion, it is doubtful that it will be operationally suitable by November to control live air traffic in Philadelphia and replace ARTS. FAA declared a smaller version of STARS operational at El Paso, Texas, on April 30. But as of May 24, according to El Paso Tower managers, the controllers at the facility are still using ARTS for emergency back-up. STARS was designed to have its own emergency back-up system, but this was not installed in the El Paso STARS version

because STARS software was being modified and the tower managers stated controllers were not comfortable relying solely on STARS. Moreover, in the 3 weeks since FAA declared the El Paso STARS operational, controllers have reported a number of “emergency” and “high priority” issues that need to be addressed. For instance, some aircraft that should be automatically displayed by STARS on the controllers’ screens are not being displayed properly. Controllers are then forced to manually work around this deficiency to control traffic. This kind of manual intervention may be temporarily acceptable in a low-density environment like El Paso, but is unlikely to be a workable solution for a high-volume environment like Philadelphia.

FAA needs to clarify what it intends to deliver to “meet” the November date, especially since we understand that funding is short, independent testing of the system is being deferred until November, the system must still be customized for Philadelphia airspace, and a presently unspecified number of trouble reports classified as critical will not have been fixed by that time.

If I can answer any questions or be of further assistance, please feel free to contact me at (202) 366-1959 or my Deputy, Todd J. Zinser, at (202) 366-6767.

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