Trip Report IV

Development of an Industry Standardized Auditing and Surveillance Tool Prototype

Investigating Team:

Dr. Anand Gramopadhye [Professor and Chair]

Dr. Joel Greenstein [Associate Professor]

Nikhil Iyengar, Pallavi Dharwada and Kunal Kapoor [Doctoral Students]

Created at:

Human Computer Systems Laboratory,

Department of Industrial Engineering,

Clemson University

Trip Location: Mobile, AL

Document Creation Date: May 9, 2004

DEPARTMENT OF INDUSTRIAL ENGINEERING
College of Engineering & Science 110 Freeman Hall Clemson, SC 29634-0920
Phone: (864) 656-4716; Fax: (864) 656-0795: Email: websat@ces.clemson.edu

I. Introduction

This document presents the details of the interviews and observation sessions held in Mobile, AL on May 5th, 2004. The team also had a telephone conversation with Larry McKinnerney (Manager Aircraft Quality Assurance, Air Operations Quality Assurance) later in the afternoon to brief him on the sessions.

The information gathered in the sessions conducted by Kunal Kapoor, Nikhil Iyengar, and Pallavi Dharwada from Clemson University's WebSAT team is summarized in this report.

Note: In this document the "impact variables" have been referred to as "process measures." This is a term that is being used by the WebSAT team temporarily until a general consensus is arrived upon with the FedEx personnel.

The remaining sections of the document are as follows:

II. Attendees of Mobile observation sessions
III. Notes from Mobile observation sessions
IV. Next steps
V. Glossary

II. Attendees of the Mobile observation session

Attendees from FedEx: Ronald R. Castagna (Quality Services Project Representative, Aircraft Quality Assurance, Air Operations Division), James Baugh (Quality Services Project Representative, Aircraft Quality Assurance, Air Operations Division).

Attendees from Clemson's WebSAT Team: Kunal Kapoor (Doctoral Student), Nikhil Iyengar (Doctoral Student), Pallavi Dharwada (Doctoral Student)

III. Notes from the Mobile observation session

The WebSAT team began the interview session by introducing the Quality Assurance (QA) representatives to the user-centered design methodology adopted by them. They introduced the concept of customer and need statements to the QA representatives. The representatives were asked to take a quick look at the needs and develop a general understanding of what was being presented.

The goal of the WebSAT team was to understand what influenced the performance of surveillance activities. What are the measures which would best reflect the efficiency of the inspection and the maintenance operation being supervised by the QA representatives? With this goal the team used the need statements obtained from previous interview sessions to formulate questions which would allow them to understand the process and the process measures. These questions were used to drive the interview sessions for the day. The information gathered from these questions and the observation

session conducted during the maintenance facility walkthrough with James Baugh have been presented below.

The QA representatives described their vision for the tool as a sampling device which will allow them to check all the work cards for an aircraft over a period of time and check airplanes that haven't been addressed. They described that the current tool allows them to decide which work cards to perform surveillance on. However, the emphasis and severity/consequence of performing the operation is not provided. For example, a reject for a work card surveillance has far reaching consequences with respect to aircraft safety than a reject for some other work card surveillance. Currently, the QA representatives use their experience to decide the severity of a surveillanced workcard reject. The limitation of the current tool is its inadequacy in providing information on the surveillance operations that have been performed during an aircraft stay at the maintenance facility and storing the maintenance history of the aircraft. The historical information associated with an aircraft which a representative would be interested in are discrepancies associated with aircraft maintenance, especially during C-checks. Occasionally improper maintenance or inspections may occur which makes surveillance paramount. Repetitive inconsistencies on an aircraft would also be important information which the representatives would like to know. If all this is adhered to, rejections will automatically be available during analysis.

The accepts, rejects, and others currently used by the tool, along with the process measures give a true picture of the effectiveness of the substantial maintenance vendor. When the question on optimum number of process measures was raised the representatives were quick to point out the confusion in the definition of the 17 process measures. They were of the opinion that the number of current process measures covers the entire gamut of surveillance activities. However, there exists redundancy. The example cited most often by the representatives to explain this was GMM and C.A.S.E 1A standards. According to them, there exists a grey area between the two categories. One plausible explanation for this is due to the fact that both CASE and GMM are required to cover almost all the maintenance activities. According to the representatives, CASE seemed to be more general in its application to surveillance while GMM was more direct. A similar argument can be made for IPMs. The IPMs are manuals kept by the maintenance facility vendor to allow their maintenance personnel and inspectors to perform maintenance and systematic inspection. Further, the QA representatives also acknowledged that they are more rigorous on surveillance compliance to CASE standards and GMM rather than IPM. Besides, the IPM will change, although not significantly, from one vendor to another. This point was worth considering when we were told that the QA representatives may be sent to other vendor facilities to perform surveillance.

It was observed by the team that the representatives took their job of performing surveillance very seriously. There is no specific information which the representatives are looking for when an aircraft comes into the facility. The aircraft and the work cards themselves dictate the nature and extent of surveillance to be carried out. They believed that they had to keep a constant vigil on the work cards that have been completed. For

this they have been using the GMM and CASE. The introduction of the 17 process measures into their daily surveillance activities is looked-at as a mere add-on. They still lay tremendous emphasis on doing their job right. Walking a better aircraft is of primary concern to them while shelf-life, house-keeping and other categories are secondary. The consequence is that they pay relatively less attention to consistently categorizing the surveillance into the 17 process measures. The team observed that there was inconsistency between the representatives for the same surveillance operations. It became clear to the team that a work card may not always necessarily fall under the same process measure. During their brainstorming sessions, before arriving at Mobile, the team wanted to know if each work card for an aircraft would always have the same process measures. The representatives pointed out that this may not be true, e.g., the surveillance performed on the work cards may be an "In-process" or "Verification." On the same note, the work card may also result in other process measures like say "Shelf Life." They also mentioned that they are in the facility to protect their product and hence spend a lot of time with the aircraft watching what the AMT are doing. As a result, the representatives most often use "In-process" or "Verification" as they spend most of their time on the aircraft which is paramount to them.

As mentioned in trip report III (Dated 8th April, 2004), the inconsistency in the categorization of a surveillance activity to its respective process measure has a lot to do with training and the manner in which process measures were introduced to QA representatives. It is a human tendency to resist change. However, the team observed that the representatives were making a genuine effort to include the process measures in their daily routine surveillance activities. Since the representatives described the main goal of their job function was to ensure aircraft safety they preferred to be 'out-there' performing surveillance rather than sit in front of the computer and enter their surveillance information. "We're not computer savvy," said one of the QA representatives. However, they also expressed that significant training might help them in acquiring better understanding on the application of process measures.

Another point which was discussed during the sessions was the importance of good data. The representatives have been used to looking for errors and inadequacies in maintenance operations – "I'm programmed on problems." However, it was also noted entering good data may off-set the maintenance inadequacies or bad data that has been collected. For example, if a representative notices on the shelf, 2 expired primers vs. 20 valid ones, what does he record - should each individual primer be recorded as a surveillance activity? The concept of criticality of data being entered with respect to aircraft safety was discussed. Later during the team's phone conversation with Larry, it was clarified that for such an example, it must be considered as a single surveillance activity as the process measure was not met completely and hence should be noted as a reject. However, the fact remains that even with this entry the severity to which the rejection was made is not clear. In other words for the same example, it is not known if the rejection involved one expired primer or many more. This information may be useful to interpret the vendors' compliance to the QA representatives' orders. With respect to the same concern of how to capture good data one of the QA representatives said, "I hope the tool caters to

this. If a work card is being accepted, all the nuances of this work card should be considered as positive data."

Often while work cards are being worked on by the maintenance personnel, non routines are generated. These non routines are also available for the QA representatives' review. They are constantly entered into the system and are displayed in the surveillance schedule (the 10% work card display). The QA representatives rarely use the surveillance schedule to note the non routines that have been generated. Often, they go to the "Dock" (the office in a maintenance facility bay responsible for the aircraft in that bay), to pull up the non routines. Note that although these non routines are available in the system, they are not used by the tool. The representatives were uncertain if information on non routines generated for an aircraft should be used to reflect on the performance of the maintenance facility.

One of the other reasons for errors and rejects that occur during maintenance operations is turnover personnel. The representatives mentioned that the vendor's maintenance crew for FedEx change regularly. "Often, I see a new face in the crew," said one representative. This is because the maintenance crews are rotated. Although this may be a good practice for the vendor it affects FedEx surveillance. He also mentioned that for this reason they have to make sure that the new personnel know what they are doing, as the degree to which surveillance is enforced and maintenance operations are carried out (e.g., house keeping and safety rail the fuel tank area) vary. Besides, FedEx has a 100% buyback policy which requires the vendor inspectors to perform 100% recheck on all the maintenance operations carried out on the aircraft by AMT. Facility based findings are always discussed by the representatives with the appropriate facility personnel in case certain discrepancies happen to arise.

The current tool does not directly present the ADs and the AD driven EOs in the surveillance schedule. This limitation of the tool forces the representatives to use the MJCS and/or the PCS to print a list of the ADs or AD driven EOs. They also pointed out that this list may change. In other words, even after the aircraft is in the maintenance facility new EOs or ADs may be added into this list. This makes it difficult for the representatives for two reasons: (a) It is an FAA requirement that surveillance is performed on all the ADs and the AD driven EOs; (b) They have no way of knowing in advance if a new AD is on its way. Currently, the representatives print the AD list when an aircraft enters the facility for maintenance; a similar list is printed when the aircraft is scheduled to leave the facility and the lists are compared to note the new ADs and the AD driven EOs. This is a manual process and hence subject to human error. Since this information is available in the system, the tool is also required to present the AD list in the surveillance schedule to clearly display the ADs on which surveillance must be performed. Further, the representatives need to be informed of new ADs and the AD driven EOs.

Categories in the surveillance activity form for Maintenance Task, Maintenance Source and Impact were also discussed by the team. The representatives expressed their

dissatisfaction on the Maintenance Task options that are available currently in the tool. One example cited was repair of a part. They are confused if it would fall in "Restore" or "Remove and Replace." However, they also strongly felt that the options provided in the online form cover all the surveillance activities. The team feels that this confusion in data categorization is only to lack of examples and training provided to the representatives in using the current tool. The representatives also pointed out that they come across changes/edits in the work cards for which they generate WCCRs. However, this is not very often.

To the team's question on the evaluation process of the QA representatives and their work, Ron replied that Brian and his auditors have checklists with CASE audits to evaluate the QA representatives. In addition to this, Brian and his auditors sample the surveillance activity on the site. For instance, the auditors would take a look at findings which might have occurred during a surveillance and back track if the finding and the cause of the finding have been taken care of. The auditors also verify if the specific activities generated by corrective actions have been implemented.

During his phone conversation with the team, Larry emphasized on the importance of the concept of risk level and aircraft safety. He mentioned that the tool should help in answering the question of "what is the risk level?" This should be in addition to the tool's ability to comment on the vendor performance. Currently, the annual performance of a vendor is assessed by counting certain repetitive occurrences, and maintenance aspects which have not been adhered to in addition to the corrective actions implemented by the vendor. Also, there is no specific numerical way used to establish the annual performance score for a vendor.

When asked about what specific information they would need to share with other departments, one of the QA representatives replied that the major findings with respect to a particular surveillance should be shared with FedEx aircraft representatives who work for Tony Boucher in Memphis and the associated vendor personnel in the facility to start rework. All specific findings should be addressed to the facility personnel who will be responsible to report the findings to associated departments.

IV. Next Steps

1) Conduct interview sessions at Memphis, Tennessee.
2) Conduct observation sessions at Greensboro, North Carolina.
3) Develop a set of process measures.
4) Conduct a survey to collect feedback from other airlines on the identified process measures

V. Glossary

This document will be used as an appendix in all the WebSAT reports. It will expand on the various abbreviations used by the aviation.

F=Form; S= System; A=Audit type; D=Department; P= Aviation Program; M=Manuals; R=Regulatory body; I=Industry Standard.

Abbreviation	Full Form	Item Type
ATOS 2.0	Air Transport Oversight System	D
ADCG	Airworthiness Directive Control Group	D
ADNT	Airworthiness Directive Notification Transmittal form	F
ADMT	Airworthiness Directive Management Tracking	F
ACAP	??	
AMT	Aircraft Maintenance Technicians	
CAMP	Continuous Airworthiness Maintenance Program	P
CASE	Coordinating Agency for Supplier Evaluation	I
CAS	Continuous Airworthiness and Surveillance	P
CRS	Certified Repair Stations	
CFR	Code of Federal Regulation	
DPM	Desktop Procedure Manual	M
EO	Engineering Order	F
EA	Engineering Authorizations	F
EAS	Engineering Authoring System	S
EOCN	Engineering Order Change Notice	F
EMRA		
EMM	Engineering, Material and Maintenance	A
ECM	Engine Condition Monitoring	A
EPI	Element Performance Inspection	A
FAA	Federal Aviation Administration	R
FR	Federal Register	M
FAR	Federal Aviation Regulation	M
FCD	Fleet Campaign Directive	F
FMR	Fuel, Maintenance and Ramp Operations Audits	A
GMM	General Maintenance Manual	M
IATP	International Airline Technical Pool	P
IPM		
MX	A Maintenance event	
MCS	Modification Control System	S
MMF	Manufacturer's Maintenance Facilities	A
MEL	Minimum Equipment List	F
MARS	Maintenance ?? System	S
NPRM	Notice of Proposed Rule Making	F
OEM	Original Equipment Manufacturer	F
PCS	Production Control system	S
PFCR	Publication Form Change Request	F
QA	Quality Assurance	D
SNRM	Non Routine Maintenance	F

Abbreviation	Full Form	Item Type
SCORE	Supplier Capability and Operational Reporting	S
Specman	Specification Maintenance	S
SAI	Safety Attribute Inspection	A
SCS	Supply Chain Services	
STS	Supply Technical Services	
WCCR	Work Card Change Request	F
WIC	Work Instruction Card	F