

# Trip Report II

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## Development of an Industry Standardized Auditing and Surveillance Tool Prototype

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## **I. Introduction**

This document presents the details of the meeting held in Memphis on the 13<sup>th</sup> and 14<sup>th</sup> of November, 2003. It summarizes the information gathered in interviews conducted by Kunal Kapoor, Nikhil Iyengar, and Pallavi Dharwada from Clemson University's WebSAT team on these two days.

The remaining sections of the document are as follows:

- II. Attendees of the interview sessions
- III. Notes from the interviews
- IV. Next steps

## **II. Attendees of the Interview sessions**

**Attendees from FedEx:** Kenneth R. Hutcherson (Manager, Aircraft Quality Assurance), William Williams (Manager, Regulatory Compliance & FAA), Billy R. Robertson (Quality Assurance Airworthiness Liaison, Airworthiness Directive Control Group), John Blaszkowski (Manager, Internal Evaluation and Audits), Brian D. Bittner (Quality Assurance Manager)

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

On the first day, Clemson's WebSAT team met Ken Hutcherson for a two-hour interview session. This was followed by a two-hour interview session with Bill Williams and Billy Robertson. The following day the team had an initial two-hour interview session with John Blaszkowski. This was followed by a two-hour session with Brian Bittner.

## **III. Notes from the Interview sessions**

A summary of our notes from our interview sessions is presented below.

### **Ken Hutcherson (Manager, Aircraft Quality Assurance)**

The session with Ken was to find answers to questions that arose during the brainstorming sessions conducted by the Clemson WebSAT team. The various points discussed during the meeting have been explained below. Ken also provided the team with copies of relevant documents.

- Ken started off by defining surveillance as day-to-day oversight of maintenance and regulatory requirements. Audits are planned events which will address specific issues- "Specific answers for specific questions."
- Substantial maintenance vendors are those who are authorized to perform C check event or higher. Ken explained the various types of checks in the maintenance industry. A service check is a weekly scheduled maintenance event. An 'A' check is

carried out after a stipulated flight hours (airtime). An 'A' check lasts for about an hour. For example, an A 300 has to complete about 150 hours to do an A check. No surveillance is performed on these checks. Service and A checks are carried out by the FedEx mechanics. A 'B' check is made when about 450 flight hours has been completed. This check will last for about 48 hrs. Roughly 95% of the B check is outsourced. A 'C' check is a heavy maintenance event and involves substantial maintenance activity. Such a check could last for about 20 days or more depending on the problems encountered. All C checks are outsourced.

- Surveillance is performed on tasks or maintenance cards based on the FAA requirements and based on trends. The trends help identify those tasks with respect to vendors if they are not being done to the level of expectation desired. Currently, FedEx does not have an automated process to pull out trends. They use their monthly reports to understand the trends based on the seventeen impact variables they have identified. Ken expressed his interest in developing a risk analysis module which will assess the maintenance operation performance in terms of the vendor and the tasks carried out. Please refer to the On-Site QA representative Desktop Procedure Manual (DPM) and/or the Trip Report dated (October 11<sup>th</sup>, 2003) for the seventeen variables identified by FedEx.
- Of these seventeen impact variables, the first four variables viz., In-Process, Verification Surveillance, Final Walkaround and Aircraft Walkaround have been developed by FedEx. The remaining 5 through 13 variables have been developed based on CASE (Coordinating Agency for Supplier Evaluation) standards. The variables 14 and 15 are based on compliance to standards established by the General Maintenance and Inspection Procedures Manual. The variable 16 is a variable used to see to it that the vendor documents non technical information as well for later reference. Fuel Surveillance is developed from intentional surveillance carried out on a substantial maintenance vendor in accordance with the guidelines set forth in the Fuel Vendor Surveillance section in the On-Site QA representative Desktop Procedure Manual (DPM).
- The team sought clarification from Ken in understanding the activities that result in Accept (A), Reject (R) or Other (O). Ken pointed out that an activity may have several line items and each line item may not necessarily be a work card. Referring to the QA Surveillance activity web page, he said that the page can be entered even without a work card or work order number. The status 'O' often includes those which would be referred to as monthly activities. When an activity is flagged as status 'O,' it is not counted against the vendor. They also refer to those discrepancies which stem from FedEx paperwork (e.g., not up-to-date manuals). This discrepancy may result in completing a Publication/Form Change Request (PFCR) or a Workcard change request (WCCR). A status 'R' results in a formal letter to the vendor. However, this is often driven by the type of reject that takes place. GMM requires all technical rejects to create a special Non routine number (NR #). The QA conducts a follow up to see if the NR is done properly. A second reject would result in another NR # and a formal

letter to the vendor. Second rejects do happen periodically, roughly at a rate of 6 to 7 per month across about 5 maintenance sites.

- Creation of the workcard begins with a program administrator who reviews the specifications behind every task. The administrator provides description and references for these workcards. The maintenance planner takes the specifications and creates the workcards. The planning department is informed about the creation of the workcards as they would need to include it in the next substantial maintenance event for the relevant airlines. Audits do not result in work cards
- A work order could contain the following:
  - 1) Maintenance program card (Work Card)
  - 2) Engineering Orders (EOs) from Airworthiness Directives (ADs) (Work Instruction Card called as WIC)
  - 3) Modified Engineering Orders (WIC)
  - 4) Engineering Authorization created due to ADs or temporary repairs (WIC)
  - 5) Fleet Campaign Directives (FCDs)
- Workcards and WICs are different in that the former is a more specific card for a particular task. The WIC, on the other hand, is a more detailed document. In fact, a work instruction card could eventually result in work cards. In this context, Ken explained that each EO driven from ADs result in a WIC.
- “Excalibur” is a web based query tool.
- “Specman” (Specification Maintenance) is the maintenance program database. It is a part of the Maxi Merlin database.
- PCS is the Production Control system and it is the approved “electronic database” for maintenance records.
- The ‘Raise Date’ in the QA Schedule Surveillance page refers to the date when the engineering planning department loads the work card into the system.
- Ken also clarified that the QA representative does not see a Maintenance Planning chart. However, he can do so by downloading it from the FedEx intranet. In order to understand which aircrafts are coming in, the QA representative looks at weekly reports that are provided to him by the onsite maintenance manager.
- On a monthly basis, Ken performs a QA Surveillance productivity report which provides the QA representative with a measured performance standard pertaining to job duties and responsibilities. This report is generated by Ken using a report writing application called “Eureka” which is used to download the information from the database. The report also ensures a standard approach to measuring surveillance and individual performance. Ken would rather have the QA representative use WebSAT to conduct the analysis and inform him of the results. Ken said, “Instead of QA

representative just entering the data, he should be able to pull the data proactively and see the report so that they get engaged to the data and ensure that the data is clear. I want them to have ownership on the data.”

- Explaining the difference between FMR audits and Fuel Vendor Surveillance, Ken called FMR as scheduled events that use a basic checklist to evaluate the fuel, maintenance and ramp operations of the site. The Fuel vendor surveillance is a trimmed down version of the FMR checklist - what Ken calls as less exhaustive “modified” checklist. Based on this result, Brian decides if an FMR is to be done.

**William Williams (Manager, Regulatory Compliance & FAA), and Billy Robertson (Quality Assurance Airworthiness Liaison, Airworthiness Directive Control Group)**

The sequential steps involved in the notification of an AD (ADNT) and its tracking (ADMT) have been discussed in Trip Report I. Bill Williams is responsible for the implementation of any new, revised or corrected ADs that are applicable to aircraft, engines or appliances operated by FedEx. The inputs provided by Bill Williams and Billy Robertson, helped the team in answering many questions related to the functioning of ADCG. It also helped the team to understand the role of ADCG in ensuring airworthiness and regulatory compliance to a greater extent.

The discussion with Bill and Billy started with questions on the issue of new ADs. They explained that each aircraft has its own AD master list. ADCG may not concur to the Engineering department’s decision on deciding if an EA, EO or FCD need to be issued. It was also mentioned that FCD is issued only for inspections. If an EO has been signed, it implies that it complies with all FAA mandatory requirements that FedEx has to meet with. One single AD can trigger any number of EOs. If there is an additional effectivity or new aircraft to which new ADs are applicable, then EO needs to be revised and calls for Engineering Order Change Notification (EOCN) which again determines whether an EA, EO or FCD needs to be issued. Essentially, the EOCN process occurs for two reasons: (i) terminate an AD or (ii) if a new aircraft is acquired, then engineering department needs to make EOCN to add the additional effectivity. “It is very critical that ADCG tracks if engineering is missing on adding other aircraft to the list.”

WIC is a document used by the mechanics to check for compliance with the AD. There could be many errors (e.g., typing errors) on the WIC. In this context, Bill and Billy have mentioned that they expect the WebSAT to be useful in performing the review of EO and WIC. Currently, they use a checklist to review each engineering order. Bill provided us with this checklist document. One of the columns in this document indicates the total number of discrepancies found in a particular EO. Bill also mentioned that this checklist could be used as a process measurement tool to identify the problems with Engineering group in EOs, etc. These discrepancies can be generated in two stages: Preliminary EO compliance and Final EO compliance.

Engineering Authoring System (EAS) consists of 2 modules: AD modules and EMRA (financial analysis). All ADs are processed through EAS via an EA, EO or FCD. If an

EOCN is issued as compliance document and it affects the original AD compliance document that was processed through EAS, the new document must be reviewed by the ADCG before it is issued. A hard copy of EOCN is filed after it is reviewed. Billy Robertson mentioned that the EO which resides in MCS is not “the EO” but is the requirements of an EO which enlists the EO#, AD# and other details.

Quarterly Status Report is reported by ADCG for In-Process ADs and NPRM (Notice of Proposed Rule Making). This NPRM is like a preliminary AD. The documentation of this status report has been provided to the team. When asked about any other airlines that follow similar procedures, Billy mentioned that Delta has similar procedures regarding Airworthiness Directives.

When the EO is generated, FedEx has WIC as attachment to EO and is put in the system. WIC gets to the maintenance personnel through the aircraft scheduling department. Billy also mentioned about the acquisition review process. This acquisition process combines EO process and other processes. He also mentioned that the French DGAC (the FAA equivalent in France) consider ADs are equivalent to CNs.

He cited an example of an acquisition process for planes from Korea. The QA representative goes to Korea, gathers data and gets AD acquisition documentation. The aircraft acquisition review process audits the AD verification report and the previous operators’ documentation. After determining the FAA-AD requirements and reviewing the existing AD Master List, the AD Master List for new fleet assignment is prepared. Subsequently, the accuracy of the previous operators’ certified AD list is determined by sampling compliance documents. The final AD list is audited and approved for acquisition prior to Revenue Service Entry. Bill provided us with a document on the Aircraft Acquisition Review process. In Bill’s words the findings obtained from their review reports are “database items.” These findings are sent to engineering saying that they need “A” mark request from FAA.

Bill explained that Self Audits are conducted within the regulatory compliance group. This self audit process evaluates how the work is done within their process. “What type of findings they have? Are they missing on any manuals, documents etc.” These self audits are conducted atleast once a year.

Bill provided us with various documents. These documents are EO review audit checklist and EO review canned corrective actions. Another document on AD Review after overhaul was provided. This document has a list of findings made after reviewing.

### **John Blaszkowski (Manager, Internal Evaluation and Audits)**

The mission of the Internal Evaluation Workgroup is to provide FedEx Air Operations Division (AOD), an accurate indication of the effectiveness of policies, processes and systems, and the overall safety risk level of the airline, using system safety, risk analysis and risk management tools. The purpose of the internal evaluation is to keep a strict vigil on the day-to-day operation of the FedEx Air Operations Division Aircraft Quality

Assurance Internal Evaluation and Audits Department. The Internal Evaluation and Audits department also provide procedures for the training and qualification of auditors and evaluators, tracking of audit and evaluation requirements, maintenance of audit and evaluation records, and the planning, conducting, documenting and follow-up of audits and evaluations. A detailed documentation of all these activities is provided in the 'Internal Evaluation and Audits Desktop Procedures Manual'. As a manager, John is responsible for the maintenance of this manual. John also has the authorization to make changes to this manual. In his absence, his supervisor, the Senior Manager of Quality Assurance, may approve changes to this manual.

His work domain consists of three categories.

The mission of the Engineering, Material and Maintenance (EMM) Internal Evaluations and Audits is to monitor all internal FedEx functions relating to Aircraft Base Maintenance, Aircraft Engineering and configuration control; aircraft parts receiving; distribution and storage; and Aircraft records. He is in charge of the heavy maintenance at FedEx facilities in Los Angeles, Memphis, and Indianapolis. He is also in charge of supporting the staff function for avionics shops and functions, and is responsible for activities such as Quality Assurance and Technical Publications. The other avenues within John's jurisdiction are maintenance planning and scheduling, aircraft stores warehouses.

The purpose of the EMM internal audit is to provide a means to measure compliance with governmental, customer, and company rules, regulations, requirements and policies. The system for EMM internal audits should be able to measure the compliance with FAA regulations, a method to report any critical findings, and a follow-up to ensure the necessary corrective action. The key audits in this category are Recurrent audits, Ad Hoc audit, and Follow-up audit. John is responsible to identify new EMM functional areas that require recurrent auditing and adding the necessary requirements to the schedule matrix. The responsible auditor consults with John to accomplish the required audits and then create a record. For Ad Hoc audits, John will assign the requirement to an auditor and provide specific information and instructions. All special audit reports are coordinated through John. Recurrent EMM audits are done on-site a minimum of one time each year, and maximum time between complete audits never exceeds 18 months. The EMM audit requirement is tracked and scheduled using Excel spreadsheets. Standardized checklists exist for recurrent audits and are revised with change in policies and procedures. Electronic versions of the checklists are maintained on the local area network. Standardized audit report formats have been developed for each audit type and are used to report these.

The second category of his work domain (similar to the first category) is to audit the Flight Operation Department. The mission of the Flight Operations audits is to provide oversight of all internal FedEx functions relating to flight operations. This consists of 22 audits. John looks after aspects such as Flight Training, Flight Standards, Flight Control, Crew Training, Crew Scheduling, etc. John's department is responsible for developing checklists for internal audits to target the mentioned aspects of flight operations. There

are fixed standards with respect to FAA, and policy & procedures, and all audits pertaining to this, are overlooked by John. The details of these audits are provided in the 'Internal Evaluation and Audits Desktop Procedures Manual'.

John is also responsible for Safety Attribute Inspection (SAI). He looks at FAA's ATOS program and uses it to do his audits at FedEx. The SAI is divided into 6 attributes - Responsibility, Authority, Procedures, Control, Process Measurement, and Interfaces. According to John, the FAA inspectors identify Responsibility and Authority under one category because of its similarities. The FAA inspectors are in the process of merging these two categories together. The objectives of these attributes are as follows:

1. Responsibility Attribute: to determine if there is an identifiable, knowledgeable, and qualified person who is accountable for the quality of the process.
2. Authority Attribute: to determine if there is an identifiable, knowledgeable, and qualified person with authority to establish and modify the process.
3. Procedures Attribute: to determine if the air carrier has documented procedures for accomplishing the process.
4. Control Attribute: to determine if checks and restraints are designed into the process to ensure a desired result is achieved.
5. Process Measurement Attribute: to determine if the air carrier measures and assesses the process to identify and correct problems or potential problems.
6. Interfaces Attribute: to determine if the air carrier identifies and manages the interactions between the process and the other element processes within the air carrier organization.

John mentioned about a government program known as ACAP. It creates risk indicators to identify the potential problem areas. John also mentioned that American Airlines and ATA have programs similar to SAI at FedEx. As of now John's department have a checklist system, question reference program, and a surveillance program to support SAI.

John mentioned about his expectations from WebSAT. John hoped that the checklist, which his department develops, would be query-based and online. He thought about self-audit on the same lines. John also mentioned about the ability to use outside factors associated with surveillance and audit to form a safety index. The requirement to have Minimum Equipment List (MEL) for each fleet was also expressed. The Engineering Conditioning Data was also of prime importance to John's department, which would incorporate certain parameters based on engine of the aircraft.

Based on Engine Condition Monitoring (ECM), for each 'No' on a checklist, a risk analysis report is generated. This helps identify a potential problem exists or not. The probability and impact of the existing problem is defined on the basis of the risk analysis report. The auditor would identify where the problem might have started and the problem is sent to the 'responsible manager.' A 'No' on a checklist can trigger more than one risk analysis report. Once a problem is identified, a debriefing takes place and, a consensus is reached, following which, a preliminary report is sent to Frank Basile (Managing Director, Quality Assurance). The responsible manager reports and rectifies the problem, and indicates what he is going to do to rectify the problem. The reports are Effective,



Most Effective, Marginally Effective, or Ineffective. These reports are addressed to the Vice-President and carbon copied to the Senior Vice-President. The Continuous Airworthiness and Surveillance (CAS) review board also scrutinizes the reports. The board consists of Director of Maintenance, Director of Safety, and the Chief Engineers. A Probability and Impact matrix is used to determine the criticality of the problem.

There are a few more points that John Made. These are:

- John's department handle about four SAIs in a year, which could generate anywhere between 30 to 50 risk analysis reports on an average.
- John also handles Element Performance Inspection (EPI). EPI is a mini-audit of the system.
- John expressed a concern about a structure to tackle concerns of flight operations. Each flight operation regulation would generate a checklist. His concern was to be able to generate a checklist for each department and maintain a question bank. It was important for him to check the validity of the checklist.
- Data analysis helps identify the risk factors. The importance of a safety index is critical to John. Data for number of Airworthiness Directives against each fleet, the failures as a result of audit findings, specific audit findings, ECM data, MEL, fleet size and mechanic size are the focus of the reliability data John is looking for to help him with his internal audits.

### **Brian D. Bittner (Quality Assurance Manager)**

Brian is responsible for the Quality Assurance of Supplier and Technical Audits. An audit is deemed necessary when a business need is identified for people other than the initial suppliers. Brian explained that the people at the airframe department do not send a vendor request too often, but it is the other departments that send out requests for a supplier audit.

#### **Supplier audit**

The approval process starts with a requirement in a specific department. A regulatory requirement is needed, and an approved vendor list is referred to. Brian pointed out that this vendor is quite active and vendors are periodically added or dropped from this list. If the vendor is qualified he may be selected, if not, then a vendor might get a temporary approval based on the qualification status in the Coordinating Agency for Supplier Evaluation (CASE) register. A disapproval of a supplier happens when the supplier is not qualified. Brian's department is responsible for surplus vendor audits which are very critical to FedEx. Distributor audits are relatively easier, especially when the original manufacturer has no problems with the concerned distributors. Vendor acceptance is based on specific quality standards and changes to these are made semi-informally. The Pre-audit standards document and inspect the current working standards of the suppliers,

before the audit starts. The two key audits for which Brian is responsible are Systematic and Non-Systematic. Systematic audits deal with understanding if the data is healthy or not, and checklists, documentation, and evidence help to do this audit. In a Non-Systematic audit, a lot of latitude is provided to the suppliers, as long as the corrective actions, if identified, are done really soon. Brian is also involved in Pre-Award audits. These consist of findings, concern, and observations. The observations might be positive or negative and are mentioned by the auditors in their reports.

### **Fuel, Maintenance, & Ramp Ops (FMR) Audits**

The mission of the FMR audits is to provide oversight functions relating to aircraft line maintenance, ramp operations and aircraft fueling, including FedEx owned or contracted. The FMR audit program is to provide internal function. The trunk operation provides oversight at the maintenance facility, and is an annual audit. The Random and un-announced audits occur at no specific time as such, and provide the most valid look into the process. The FMR audits occur once each year, and the time duration between audits does not exceed 18 months. The scheduling of these audits is not difficult, since there are 160 ramps or locations where FMR audits are performed. Fuel vendor surveillance is different from FMR audits. Fuel vendor surveillance is performed on substantial maintenance vendors. A fuel vendor is given a 5-day notice prior to surveillance. A summary of this surveillance and its effect (from the vendor's point of view) is as follows: a description of the investigation indicates to see how large the problem is; action for short and long terms are categorized; and finally the vendor is asked to mention and document what they are doing to avoid certain problems from occurring again. The checklists with respect to the fuel surveillance are fed into the system by Ken Hutcherson, and checked by Brian. On-line surveillance system is desired here by using performance metrics.

Brian also mentioned that the Flight Safety department, the FMR audit department, and the FedEx corporate body do the Joint Audits. The Flight Safety unit consists of pilots, mechanics, and the people in charge of the ramp-up operations. The FedEx corporate group is responsible for the financial and individual safety aspects. Coordination of these three different groups to do the audits is the only motive behind a successful joint audit, and Brian saw no significance of joint audits on WebSAT.

Brian indicated that MARS includes comprehensive information about the vendors.

As of now Brian does not use any performance metrics to evaluate the effectiveness of audits done by auditors in his department. His intension is to come up with performance measures to help him come up with quantitative and qualitative measures of his department's audits.

The team managed to gather some more information while talking to Brian.

- FSC stands for the Federal Supply code.

- There are about 145 repair vendors listed with FedEx
- The Viper Database is an old database which no longer exists.
- Line Maintenance and Ramp audits are scored. Each checklist item is weighted which gives a score. The score ranges have quality ratings tied to them. This would help indicate the “quality” of the score.

#### **IV. Next Steps.**

The issues that the Clemson WebSAT team will address next will include

1. Conduct observation sessions at the maintenance hangar in Mobile, Alabama.
2. Identify impact variables using the need-metrics matrix.
3. Submit a report on the methodology applied to identify the impact variables.
4. Schedule data gathering sessions at Memphis, TN.
5. Conduct a web based impact variables validation survey with other airlines to ascertain the accuracy of the selected impact variables.