



Nadcap Measurement & Inspection Newsletter

May 2015

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Editors

Jim Bennett
Simon Gough-Rundle
Norman Gross
Carol Martin



From the Chair...

Hello and welcome to the Spring M&I newsletter. This is already looking to be a busy and successful year for the M&I Task Group. Firstly, all the checklists have been modified to reflect the more streamlined audit process and achieve the target two day duration. Secondly, the checklists for AC7130/0 (General inspection), AC7130/2 (Laser Trackers) and AC7130/3 (Articulated Arms) have been finished and will be balloted, completing the set of checklists that the Task Group set out to achieve. And thirdly, and perhaps the most significantly, mandates. Following the meeting in Berlin (March 2015), and the changes made to the audit program on duration, 2 or 3 of our Subscribers (Primes) now plan to mandate in the coming year.



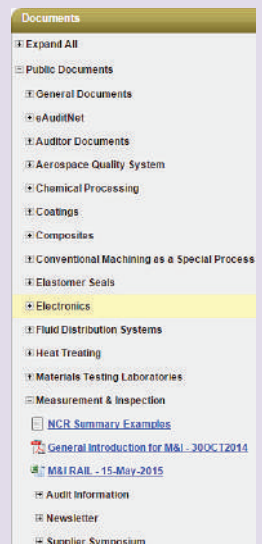
Simon Gough-Rundle

Before I discuss the layout of the revised checklists and their purpose, I would like to personally thank the Task Group for their amazing effort in achieving the progress to date. I personally feel very proud of the portfolio which now provides a flexible and pragmatic approach to Measurement and Inspection, without adding a massive burden on the supply chain. It is only with a strong and competent team, made up of both Subscribers and Suppliers, that we can generate such a great outcome – Thank you!

This great working group of individuals brings together measurement, inspection and calibration experience from multiple aerospace backgrounds and has resulted in the completion and the timely release of the revised AC7130 (Base), AC7130/1 (CMM) and the AC7130/5 (Mass air flow) checklists. This is a massive step towards our primary aim of generating a complete and pragmatic set of checklists to cover the major measurement technologies. By continuing to target Subscriber requirements, we aim to facilitate a reduction in Subscriber-specific audits through the provision of our generic program. Cost reduction is after all a global Aerospace issue that we are all trying to combat.

Over the next couple of years, our focus will turn towards maintaining the checklists, hiring Auditors, Auditor consistency, and audit metrics as with other Task Groups within Nadcap.

If this is the first newsletter you have read and you are looking for some guidance on M&I, I recommend you take a look at the presentation highlighted in the list on the right, contained in eAuditNet (www.eAuditNet.com) under Resources - Public Documents.



continued on next page

From the Chair... continued

In regard to the checklist layout, the format has been changed on the three existing checklists and also incorporated to the three latest checklists on ballot. To help provide a more consistent approach to auditing for both the Supplier and Nadcap Auditor, the structure of the checklist now flows as a company may expect to be audited. This will assist in providing consistency for the Auditor and will provide a common flow for all measurement and inspection audits. The new flow makes greater use of job-based audits which, as Engineers, is a lot easier to follow than the procedural questions used before. The change to this structure, together with a risk-based rationalization of the questions has facilitated the reduction in audit duration.

As Jim Bennett will mention in this newsletter and during the face-to-face meetings, there is a need to train Auditors for this program (CMM, Laser Trackers, and Articulating Arms) and this requires training sites. While M&I is in the process of mandates, if you are interested in 'opening your doors' for a test audit or official Nadcap audit in the above technologies, please let Jim Bennett, our Staff Engineer, know. This is a great opportunity to learn from a training audit, investigate issues raised, and have the time to implement improvements on your own time scale. Jim's details can be found at the end of this newsletter.

Simon Gough-Rundle

M&I Chair and Rolls-Royce (Assistant Chief Metrologist)

M&I Newsletter – Want to be on the Circulation?

The M&I newsletter is published periodically throughout the year. The newsletters are read by the Nadcap Subscribers, Suppliers, Auditors and anybody that happens to click on the latest M&I newsletter on the PRI website (www.pri-network.org/about-pri/media-center/key-documents). The aim of the newsletter is to communicate information relating to M&I within the Nadcap program to improve our process and to promote the sharing of best practices at all levels.

Have you stumbled across the M&I Newsletter by chance? Want to receive it on a regular basis? Keep up-to-date regarding the latest Nadcap M&I information by being added to the distribution list! To receive notification when a new edition has been published, please contact PRI (contacts on the last page) with your name, company and email address.

Nadcap Meeting Schedule

Nadcap meetings take place three times a year in locations around the world and are open to all Nadcap stakeholders and interested parties. The table identifies the meeting dates and locations through 2015.

2015	
June 22 - 26	Montreal, Quebec, Canada
October 19 - 23	Pittsburgh, Pennsylvania, USA

The October meeting is held annually in Pittsburgh, Pennsylvania, USA. The Saturday and Sunday prior to the Task Group meeting comprises of an annual conference where all the Nadcap Auditors are updated on the program, policies, expectations and commodity (e.g. M&I) related issues.

The Task Group meetings comprise of open and closed meetings. Open meetings are for all Nadcap stakeholders and interested parties when items of a confidential nature are not discussed. Some examples are checklist discussions, procedural requirements, technical clarifications not associated with an audit, metrics, general M&I information, etc. A closed meeting is held for

Nadcap Subscribers where confidential information is discussed, for example: mandate discussion / status, Auditor issues, process escapes, Supplier advisories, audit report packages, etc.

There are many advantages to participating in a Nadcap meeting, such as:

- Learning about and participating in Task Group activities, such as checklist development
- Nadcap Management Council (NMC) and Supplier Support Committee (SSC) meetings to learn about current activities in the Nadcap community and sub team initiatives
- Networking with other delegates including aerospace Prime contractors, Suppliers and PRI staff
- Benefiting from free eQualLearn training such as Root Cause Corrective Action, How to Prepare for a Nadcap Audit and Introduction to Pyrometry

If you are interested in attending the Nadcap Task Group meeting, please register at <http://www.p-r-i.org/nadcap>

And note also that there are no fees to attend the meetings.

James E. Bennett – PRI Staff

Previous Newsletter Articles

Periodically, a reference table is published that lists all the subject matters from the M&I Newsletters up to the latest issue. This can help provide useful articles from old Newsletters that still apply, but is also a good way of letting new readers know whether a subject matter has been addressed already. If there is a topic that you don't see and would like to know more, please notify the author for consideration on future newsletters.

Below is a table of Articles that have been covered so far:

The newsletters can be found on the PRI website as follows:

<http://p-r-i.org/about-pri/media-center/key-documents/>

Title	Issue
Audit Preparation	March 2015
Audit Handbook	October 2014
Auditors	June 2014
Mandate Status	Most recent issue
Top Findings for M&I	October 2014
Voting Members	Most recent issue
What is M&I?	June 2014
Why M&I?	June 2014

Call for Training Audits

As a new Nadcap group is developed, one of the challenges that can occur is Auditors. Auditors are contracted, so it is not always possible for Auditors to 'sit around' waiting for a mandate to be released and then for the audits to trickle in. As the mandates and audit needs increase, there will be a need for Auditors. So far, the M&I Group has three Auditors in the US and two Auditors in the UK that are at various stages of training. Part of that training includes training audits. These training audits allow the Auditor trainee to witness a Nadcap M&I audit taking place and the opportunity to conduct an audit under the direction and guidance of the Subscribers and Auditor Trainers.

There is currently a need for test audits, to ensure we have a sufficient amount of Auditors to take on the first wave of audit requests. To address this goal, the Staff Engineer is looking for facilities to open their doors and allow PRI/Nadcap to conduct training audits for these Auditors using the applicable Nadcap M&I checklists related to CMM's, Laser Trackers and Articulated Arms. These training audits would not be the 'official' Nadcap M&I accreditation audit (no charge for the audit), but

more of a gap analysis for a Supplier to establish whether they could obtain accreditation in M&I or whether additional work is required. From a Supplier perspective, this can be invaluable because the audit results would not be published on eAuditNet, as it was a simulated audit. The Task Group would benefit from having a trained Auditor that can go out and perform Nadcap M&I audits. It is a 'win-win' for all involved. The only cost would be the time and any possible inconvenience of having an Auditor on the shop floor during production. If this is an area you would like to pursue, please get in contact with the author. However please note that it will be on a first come, first serve basis. The number of training audits is limited due to the number of Auditors currently under training.

James E. Bennett – PRI Staff

Call for Auditors

In addition to the training audits, the M&I Task Group is also looking for Auditors (independent contractors). With impending mandate notifications being released, there will be a need for additional Auditors to support the program. PRI is in search of individuals with relevant aerospace experience to work as independent contractor Auditors for the Nadcap M&I program. If you, or someone you know is interested in this opportunity and meet the minimum requirements (defined below), then consider completing an application on www.eAuditStaff.com and select Open Opportunities, Measurement and Inspection.

- 5 years' experience as a Manufacturing / Quality Engineer
- Metrology knowledge
- Ability to read and understand engineering drawings / CAD Data
- Inspection System Experience
 - Measurement Analysis
 - Method
 - Computer Aided Inspection (Laser Trackers, CMM's, etc.)
 - First principles (clocks, gage blocks, sine plate, micrometers, calipers, etc.)
- Inspection jigs and fixtures
- Programming experience
- Degree **OR** equivalent in an Engineering field
- Relevant training and inspection in M&I
- Auditing experience

James E. Bennett – PRI Staff

What happens to the Audit Report from my recent Audit?

For those Suppliers not familiar with the Nadcap program, all audits conducted are recorded and logged in eAuditNet (www.eAuditNet.com). eAuditNet holds anything and everything that is associated with the Nadcap accreditations. All audits are completed by the Auditor using an offline checklist program which is part of eAuditNet. All the questions are answered electronically, which is the same for the nonconformances. eAuditNet keeps every audit report package since the release of eAuditNet, back in 2002. That means that all existing and future Nadcap Subscribers (customers) have the ability to review the results and responses to the latest audit, but also any older audits. It is important to keep this in mind when addressing any nonconformances and further stressing the need (as indicated in previous newsletters) for effective pre-audits using the Nadcap checklists.

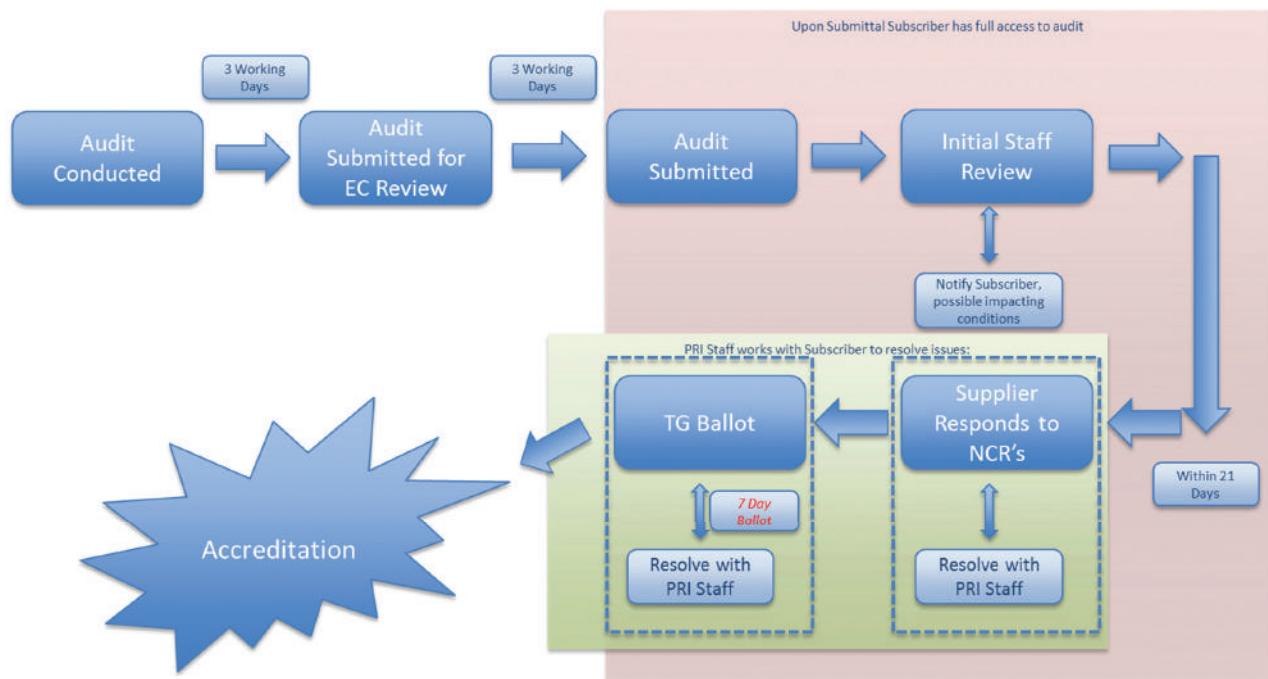
To help explain the process flow of an audit report package and subsequent accreditation, please refer to the diagram below.

Key Points

- The Staff Engineer is responsible for processing the audit reports through the system with the Supplier, so that it may be presented to the Task Group to determine if accreditation is granted or not. Once the audit is completed and submitted, the Supplier will be in communication with the Staff Engineer.

- When an audit is completed, the Auditor has three working days to upload and submit the audit to eAuditNet. Once submitted, the audit goes to Export Control review.
- Staff Engineers holding an unrestricted classification (US Citizen / Green Card Holder) are responsible for reviewing all audits prior to open release to the Supplier and the subscribing primes to verify that the audit report does not contain any information pertaining to Export Control.
- If an audit does not have any nonconformances to address, then once the audit is released from Export Control, the Supplier has three working days to respond to the Auditor evaluation.
- For audits with nonconformances, the Supplier has twenty one (21) days to provide an initial response to the findings. See later articles in the newsletter on how to address nonconformances and applicable timelines.
- When the Staff Engineer is satisfied with all information pertaining to the audit report, it can be accepted /closed, then the Staff Engineer will forward the audit report package for a seven (7) day ballot with the Task Group. Upon closure of the ballot and addressing any comments, the Staff Engineer will process the accreditation.
- Accreditation is not granted until all nonconformances can be closed out.

James E. Bennett – PRI Staff



How to address Nadcap findings (nonconformances)

One of the challenges of an accreditation can be dealing with the findings and the perceived 'pain' of getting a finding or a nonconformance closed out. Addressing non conformances is a pain, but it does not have to be painful. Suppliers typically do an excellent job of complying and containing the situation. The problem is typically associated with the root cause and the long term corrective (preventative) action. These two items work 'hand in hand' as it is not possible to know the long term preventative action until you know the root cause to the situation. Many responses indicate the immediate corrective action as the long term preventative action. A good example would be a procedural nonconformance, where the long term preventative action was to modify the procedure to comply with the checklist requirement. This is not preventative action. To help explain and understand how the process works, information from a series of PowerPoint is incorporated into this article. These slides form part of the Supplier Symposium that was held back in October 2014, during the Pittsburgh meeting.

Responding to nonconformances

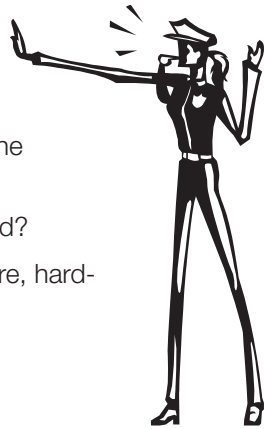
Five questions that Suppliers must answer in an NCR:

- Immediate corrective action taken (containment actions)
- Root cause of nonconformance
- Impact of all identified causes
- Action Taken to Prevent Recurrence
- Effectivity Date

Immediate Corrective Action

What action was taken following the issue being discovered during the audit?

- Did you stop the problem from continuing?
- Did you become compliant with the requirement?
- Did you contain the problem found?
- Were any other aspects (procedure, hardware, etc.) affected by this NCR?



Root Cause

Why did this situation occur?

There are a number of tools that can be used to help determine the root cause. It is important, however, to consider the following:

- Why was this not identified during the pre-audit using the Nadcap checklists?
- How was this question answered, and what objective evidence was reviewed to consider the item as compliant?
- Why did the engineer not identify this issue?
- What involvement does the person or area have in the system?

The root cause is the last logical cause in the chain. A good question to ask yourself "Think you have it?" Try going one more.

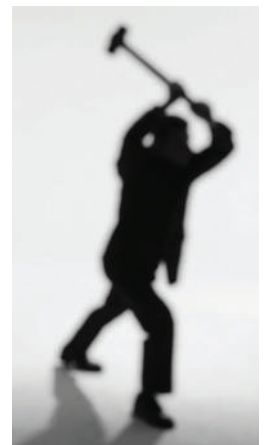
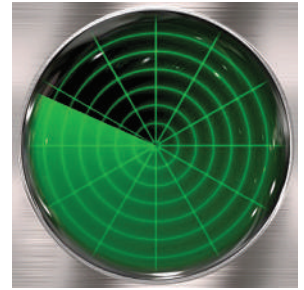
Some examples of poor root cause responses:

1. "This checklist is wrong"
2. "It's not a customer requirement, therefore the NCR can be voided"
3. "We have been audited by our customers and it has never been a problem before"
4. "I inherited this audit, so it was not my fault"
5. "Operator Error"

Impact

What impact did the nonconformance have on products previously inspected?

- Were parts or the integrity of the process affected in any way?
- What about other individuals that are part of the inspection process?
- Consider other parts and not just the part identified in the nonconformance. It could be a systemic problem.
- Were parts shipped to customer? Failing to comply with customer requirements may result in need to contact customer for additional investigation or corrective action.



Preventative Action

What is the long term action taken to prevent the situation from occurring again?

- Can only be addressed when the root cause is understood.
- Do not rush to provide a response. Consider the effectiveness, feasibility, suitability to the company, and the company's budget.
- All nonconformances must be closed out before accreditation can be granted



Objective Evidence

What information can be provided to demonstrate the corrective action taken to address the nonconformance?

- If a procedure changed, clearly specify what the change was and show evidence the procedure was approved (as applicable).
- Potential for Impact Hardware investigations
 - Provide the investigation report, include photographs
- Training/awareness of personnel for the immediate action taken and also the long term preventive action
 - Typically these would be different individuals
 - Provide evidence (sign off sheet)
- Change or create a procedure? Implement a new system or method? Perform training / awareness; propose audits, new checklists, etc.? SHOW IT!



When responding to nonconformances in the system, be sure you know and understand the information you are posting. Consider that existing and potential customers will look at the responses when reviewing the audit report package. Also, consider that this historical information is available at the touch of a button 24 hours a day, 7 days a week, and 365 days a year. Do not post any information that you may later regret.

James E. Bennett – PRI Staff

Audit Report / Accreditation Timelines

While it may be perceived as negative, referring to the process of nonconformances and timelines, it is important to discuss these items to provide as much information / guidance up front.

As with all systems that record timelines, there are metrics. When there are metrics, there is monitoring and goals to achieve. Nadcap is no different. Total cycle time, Supplier cycle time, Staff Engineer cycle time, and Task Group cycle time all have goals. M&I metrics form part of the overall Nadcap metrics to monitor the health of the program.

The goal is that from the start of the audit to granting accreditation, it takes an average overall cycle time of fifty three (53) days or less. This is quite an achievement. It can be more difficult for new commodities that are just starting with Suppliers that may not be familiar with the Nadcap process. As previously noted in earlier articles, accreditation will only be granted once all the nonconformances and comments have been closed out to the satisfaction of the Task Group. With that in mind, the cycle time of the audit can be important if a Supplier is waiting for a calibration to be performed in a timely manner, or there is a need to change the system in some manner.

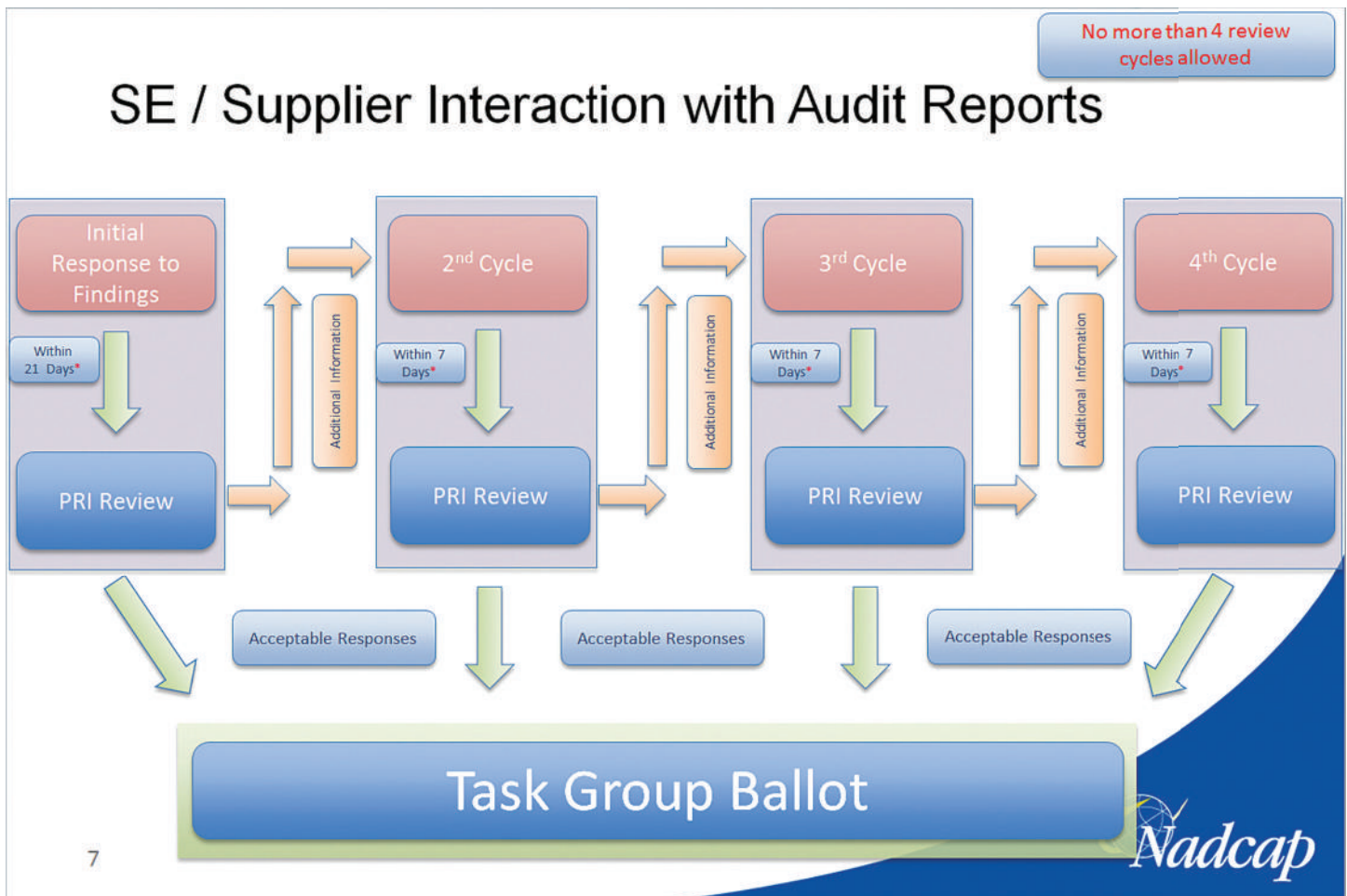
From experience, meeting such goals can easily be achieved if the appropriate preparations have been conducted prior to the official audit (e.g. pre-audit, using the Nadcap checklist, with the necessary objective evidence) resulting in minimal or zero (0) nonconformances.

On the next page is a graphic that provides an explanation on how the review and timelines of the nonconformance can affect the overall process.

While the timelines for the 2nd, 3rd and 4th cycle are tighter than the initial response time, it is important to note that the Supplier has a pool of 30 'late days' that can be used through the life of an audit report package. While the term 'late' days can be seen as a negative term, it is important to use those late days if additional time to address an item requires more attention. It is better to use a couple of late days than use up review cycles. There are, however, some restrictions which are important to note:

- Supplier cannot use more than thirty (30) 'cumulative' late days
- Supplier cannot use more than fourteen (14) 'cumulative' late days to maintain 18 months accreditation frequency

SE / Supplier Interaction with Audit Reports



- Supplier cannot use more than seven (7) 'cumulative' late days to maintain 24 months accreditation

The point to the above is that on extended accreditation frequency the NCR's are either minimal (easy to fix) or there are zero (0) non conformances to address. (Note accreditation frequencies will be addressed in a future newsletter).

Below is an example to help explain the cumulative lateness through the life an audit report package.

Cycle 1: Supplier response required – 1 Oct 2015, response received 3 Oct 2015.
Late Days: 2

Cycle 2: Supplier response required – 12 Oct 2015, response received 12 Oct 2015
Late Days: 0

Cycle 3: Supplier response required – 20 Oct 2015, response received 29 Oct 2015
Late Days: 9

Cycle 4: NA – nonconformances were closed out and sent to the Task Group for ballot
Cumulative lateness: 11 days

James E. Bennett – PRI Staff

Meet the M&I Task Group Representative – GE Aviation

To continue with our 'getting to know key contributors' to the Nadcap M&I Task Group, we have Al Berger from GE Aviation. GE Aviation is the first subscriber to mandate M&I on their Supplier base. While the mandate is only for Airflow testing, the mandate has paved the way for other subscribers to see the Nadcap process in action and its value to the industry. Al's contribution and direction has been invaluable to the process and he is not afraid of getting his hands dirty in the other M&I checklists that we have developed. Without further ado, I will pass you over to Al.....

My name is Al Berger, and I have been working with General Electric Aviation for over 30 years. A good portion of my career has been spent designing, building, and installing automated Non-Destructive Evaluation (NDE) systems in GE Aviation shops. The first few projects I worked on were automated fluorescent penetrant inspection (FPI) systems. One system incorporated a scanning laser with a yellow/green light sensitive sensor and another used a ultra-violet light source with a CCD camera.

After these projects, I began work with Airflow Measurement. The proper distribution of air to internal components of a turbine engine is critical. The major portion of the air that enters the engine is used for propulsion. Another portion of air is used for the cooling of these components which can operate in an environment where the temperature is above the melting point of the base material. When these parts are manufactured, they are tested to verify they flow the correct amount of air before being assembled into an engine.

During a production Airflow inspection, a master part that has known flow values is tested to verify that the measurement system is providing correct readings. My experience with Airflow began with calibrating these master parts.

After a couple of years calibrating the master parts, I progressed to building and installing Airflow measurement stands. I enjoyed building and troubleshooting the stands. Sometimes troubleshooting the equipment was quite challenging. Finding air leaks in an Airflow stand can be tough

because leaks can be small. But, the equipment needs to be leak tight. Occasionally, I would have a section of plumbing that I just could not find the leak. So I would pressurize the section and take it to one of our large ultrasonic inspection tanks and submerge the section in water. The air bubbles would tell me right away where the leak was.

The building of Airflow equipment was eventually transitioned to an outside company, and I began working in our digital X-ray inspection group. I was responsible for our X-ray applications lab. We provided services that could inspect an engine part and provide digital images of the area of interest. These images would be converted to a file format that could be used in presentations and provided to the design team for



evaluation. This was a definite advantage over film X-ray.

My current role is Airflow Measurement Special Process Technology Leader. My past experience with Airflow measurement gives me the base knowledge needed for this position. I work with internal shops and Suppliers related to the compliance and implementation of Airflow inspection processes.

Outside of work, I enjoy spending time with my wife Linda of 25 years along with our 23 year old daughter Kelsey and 21 year old son Kyle. I also enjoy motorcycles. If it has two wheels and motor, count me in.

Al Berger – Airflow Measurement Special Process Technology Leader, *GE Aviation*

Meet the M&I Commodity Service Representative – Carol Martin

My name is Carol Martin, and I have been working as a Commodity Service Representative with PRI since February 9, 2015. Besides assisting Measurement & Inspection, I also support Composites, Conventional Machining as a Special Process, Electronics, Non Metallic Materials Manufacturing, and Non Metallic Materials Testing.



I have a Bachelor's Degree in Finance from Robert Morris University, and mostly recently worked at First Niagara Bank as a Senior Customer Service Representative.

I am licensed in the state of Pennsylvania to sell annuities, life and health insurance.

Previous to working in banking, I was a consumer sales representative with Lorillard and RJR Nabisco. Additionally, after college, I managed a women's clothing store and worked in another women's clothing store on a part time while my children were younger.

I live about 10 minutes from PRI with my husband Rick, along with our sons Jason, 20 years old, and Troy, 18 years old.

Outside of work, much of my time is spent watching my boys play baseball. I also enjoy reading, gardening, and pretty much any outdoor activity.

I look forward to personally meeting all M&I Task Group members in October.

Carol Martin – PRI Staff

M&I Voting Members

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