Nadcap Measurement & Inspection Newsletter

October 2014

Issue Highlights

Editors

James Bennett

Savannah Garland

From the Chair…

Hello again. Firstly I would like to begin by saying 'thank you' for reading our newsletter and the massive amount of positive feedback given to both myself and the team. Please continue to provide feedback, including any specific information that you feel would be worthwhile of an article. We will always be looking for article writers, so if you have something that is of interest to the Nadcap M&I Program, please communicate with PRI Staff (Jim Bennett and Savannah Garland). Our goal is to issue a newsletter prior to each of our face-to-face meetings (three times a year).

Simon Gough-Rundle

At the time of writing this article, I am pleased to hear from PRI that we have received our first Nadcap mandate for M&I, specifically Air Flow (AC7130/5) with the first audit scheduled for November 2014. This is a major accomplishment for the group and demonstrates a commitment that M&I is on the map and here to stay. It is expected over the coming months that other mandates will be issued and additional audits scheduled.

At the October meeting, which will be held in Pittsburgh, the M&I Task Group will be meeting from Monday (20th) through to Thursday (23rd). Prior to this, there is a conference for the Nadcap Auditors developed and organized by PRI on the Saturday (18th) and Sunday (19th). PRI will hold an all-day conference on the Saturday for specific PRI training, and then on Sunday each of the commodity groups will hold their own training sessions that address commodity and checklist specific topics. M&I will be holding a training session for the M&I Auditors. Both the Subscriber and Supplier Voting Members will be in attendance. This offers a great opportunity for the Auditors and Voting Members to meet and discuss the program.

In addition to the Auditor Conference, the M&I Task Group will be holding a Supplier Symposium on the Wednesday (22nd). This symposium or workshop has been developed for all Suppliers interested in M&I and will explain the Nadcap program in general, the checklists, what to expect during a Nadcap audit, how to prepare for a Nadcap Audit, and how to respond to any nonconformance reports. This is a great opportunity for Suppliers to meet with the M&I team, ask questions, and meet with fellow Suppliers to learn of their experience of the Nadcap Program. On the Nadcap website, underneath the REGISTER NOW button, there is a link to Supplier Work Shop registration. Click on the link and register as you would for the Nadcap meeting. The link is https://events.r20.constantcontact.com/register/eventReg?oeidk=a07e9mpg8o2b0df2da9&oseq=&c=&ch=

I look forward to seeing you all at the October meeting or at the Supplier Workshop.

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 (http://www.p-r-i.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.

2014	
Oct 20 - 24	Pittsburgh, Pennsylvania, USA
2015	
Mar 2 - 6	Berlin, Germany
Jun 22-26	Montreal, Quebec, Canada
Oct 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: examples being mandate discussion / status, Auditor issues, process escapes, Supplier

advisories, audit report packages, etc. Currently for M&I, the only closed session is scheduled for Tuesday morning. This allows Suppliers to attend other meetings, such as the Supplier Tutorial, that provides an explanation about the Nadcap program (in general terms). All other M&I meeting agenda items are open.

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

- Learning about and participating in Task Group activities, such as checklist development
- Attending 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 eQuaLearn 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 in October (which will include a Supplier Symposium for M&I), please register at http://www.p-r-i.org/nadcap-meeting-in-pittsburgh-october-2014/

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

James E. Bennett – PRI Staff

Mandates for M&I

Understandably so, these are the three questions which are most asked, after 'what is this M&I I keep hearing about?':

- When will M&I be mandated?
- How long will the audit be?
- How much will it cost?

Mandates:

Since the release of the first checklists in January 2014, namely AC7130 (core checklist) and AC7130/1 (CMM checklist), there has been much focus on Subscribers addressing the issuance of mandates and the methodology used to flow this down to the Supplier base. Whether it is the method of communication, determining a roll out plan, Supplier base, etc., there has been a lot of work involved internally within the Subscribers.

At the time of writing this article, the AC7130/5 (Airflow) checklist has been released. As a result GE Aviation immediately issued a mandate to their supplier base. GE Aviation is the first Subscriber to mandate M&I!! It is expected that other Subscribers will be releasing mandates for this checklist and others throughout Q3, Q4 of 2014 and Q1 of 2015.

Audit Duration:

Audit duration is dependent on the technology accreditations sought. If a company requires accreditation for CMM (AC7130 & 7130/1), the duration will be three days. If seeking accreditation to Airflow (AC7130 & 7130/5), the duration will be two days. It is likely that the duration for Laser Trackers and Articulated Arms (once released), will follow the same path as CMM's (three days). There has been much discussion on the audit duration and, based on the six audits that have taken place, the duration has been set correctly. Otherwise, the checklist would need a reduction in questions, which could affect the whole purpose of developing the M&I program. These are of course general audit durations. If two technology accreditations such as CMM's and Articulated Arms is sought, based on the above would result in six days of auditing. Well that is not the case. At most it would be five days; however until multiple technology accreditations are required, the duration cannot be fully determined. It is one of the areas that will be focused on over the coming months as audits are scheduled. Providing the integrity of the audit is not compromised, the Task Group will certainly look into reducing the audit duration as necessary depending on the multiple technology accreditations required.

Audit Cost:

It is not the intent of the author to identify the costs of the audit in this newsletter. Any information relating to audit costs are contained within eAuditNet, so it is encouraged to visit this website so that the audit pricing document may be downloaded and reviewed.

For further information, please go to the following (remember that you will need to register in eAuditNet first. It's free.)

www.eAuditNet.com

1. Select Resources
2. Select Public Documents
3. Select General Documents
4. Click on the audit pricing attachment as shown in the screen shot below
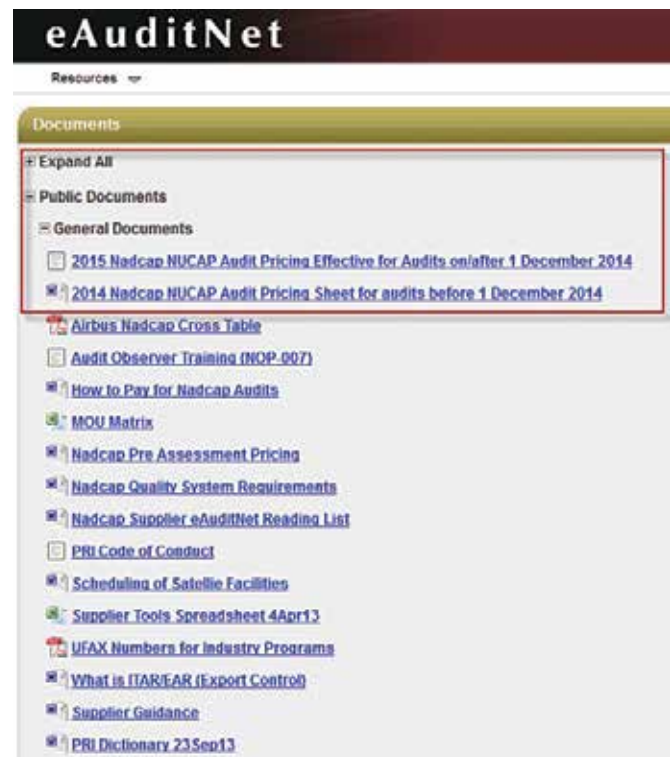
There is also a wealth of information available regarding Nadcap and M&I. Feel free to open the Measurement and Inspection folder (in Public Documents) to see what is currently being worked on in the Task Group.

James E. Bennett – PRI Staff

Checklist Status

Core and CMM Checklist (AC7130 & AC7130/1)

As indicated earlier, these checklists were released in January 2014.

Airflow Checklist (AC7130/5)

At the time of writing this article, the checklist has just been released.

Laser Trackers (AC7130/2)

The checklist has been drafted and is in the process of being issued for ballot. The anticipated release is for November 2014.

Articulated Arms (AC7130/3)

It is in the process of being developed with the sub team. The anticipated release is for December 2014.

AC7130/4

This checklist does not currently exist, but will be used for the next checklist that will be developed (no technology identified at this point).

James E. Bennett – PRI Staff

Supplier Symposium

Slowly more companies are beginning to hear about Nadcap and the M&I Program. For some, Nadcap is very new, and for others, it is simply a matter of extending existing accreditations to include M&I. Either way, it is important to learn and understand the requirements and expectations of the M&I checklist. To assist in providing information about preparing for the Nadcap audit, what to expect during the Nadcap audit, responding to non-conformances, supplier experiences, etc., the M&I Task Group will be holding a supplier symposium during the Nadcap Task Group meeting being held in October 2014. This will take place Wednesday, October 22, 2014 following the Nadcap Management Council (NMC) meeting. If you are interested in attending this Symposium, please ensure you register online for the M&I Symposium. This is a separate registration to the Task Group Meeting and can be found on the following link: https://events.r20.constantcontact.com/register/eventReg?oeidk=a07e9mp-g8o2b0df2da9&oseq=&c=&ch=

James E. Bennett – PRI Staff

Top Findings for M&I

Since the M&I group began, test audits have been performed to verify that the checklists as written contain the correct technical content, layout and expectations to meet the demands of the M&I Task Group.

A total of six audits have been conducted: five (5) for CMM and one (1) for Air Flow. The CMM audits were for three (3) days and for Airflow, two (2) days.

Contained in this article are some brief examples of the findings identified during these audits. Further content and how to address compliance of the NCR's, will be provided during the supplier symposiums and also available through the audit handbook.

Calibration

Example 1:

Checklist #	Paragraph #
AC7130	4.2.1.5, 4.2.1.6
AC7130/1	5.4

☒ Supplier to evaluate impact ☐ Systemic ☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☒ Major ☐ Minor

Identified Nonconformance

Calibration results reviewed identified that CMM serial #1234 (cal cert #5678, dated 03DEC2013) was found to be out of tolerance in the as received condition. There was no evidence to show any appropriate action taken as result of this condition.

In addition to the Nadcap checklist requirement, the supplier's internal calibration procedure CP-1173, rev 2, para 2.3 requires a report to be issued by the quality department for all out of tolerance conditions reported.

NCR classified as Major. Supplier to evaluate impact to the integrity of the inspection process and investigate if other equipment calibrated is in the same situation.

Example 2:

Checklist #	Paragraph #
AC7130	4.2.2.3

☐ Supplier to evaluate impact ☒ Systemic
☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☒ Major ☐ Minor

Identified Nonconformance

Calibrations are performed on site by the external calibration sub-contractor. Certificates are provided as required, however there does not appear to be any evidence that the supplier has reviewed the calibration records. This does not meet the requirements of the Nadcap checklist but also the supplier's own internal procedures (CP-1173, rev 2, para 5.1), which also requires calibration records to be reviewed upon receipt.

The auditor reviewed numerous certificates and found no out of tolerance conditions, so no impact is suspected. There is however a systemic issue in that the certificates do not appear to be reviewed and the supplier is not in compliance with their own procedure.

Major NCR.

Competency

Example 3:

Checklist #	Paragraph #
AC7130	5.1.2, 5.2.2, 5.2.3
AC7130/1	12.3

☐ Supplier to evaluate impact ☒ Systemic
☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☒ Major ☐ Minor

Identified Nonconformance

The company has a procedure for the training and qualification of inspection personnel, via QP 1015 rev 2. This references training in a generic sense for inspectors through a series of training criteria / work experience documents, completed by the individual and signed off by the responsible person. These documents focus on basic metrology requirements for inspector's using general gauges. There are no requirements identified for CMM inspectors in terms of training / On the Job Training (OJT), assessments, etc.

When reviewing the documentation for CMM inspectors, it appears that they undergo training through the equipment manufacturers, but this is not identified in any procedure, job description or training outline.

Training records were reviewed for the inspectors which included gauge inspection. The content of the paperwork was inconsistent throughout, demonstrating a lack of a training / qualification system.

No impact is suspected. While records were inconsistent, there was evidence of training and evaluations (once clarified). Inspectors interviewed during the audit were found to be knowledgeable in the process. The issue is the lack of a procedural system in place.

Competency

Example 4:

Checklist #	Paragraph #
AC7130	5.2.1, 5.2.3, 5.2.6
AC7130/1	12.3

☐ Supplier to evaluate impact ☐ Systemic
☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☐ Major ☒ Minor

Identified Nonconformance:

1. M&I Personnel records reviewed for a number of CMM inspectors. The following areas were found to be non-conforming:

- Records do not identify the role performed by the individual.
- The skill check performed does not identify the parts (part #, material, etc.) that were used.
- The skill check does not identify the results of the inspections obtained by the inspector.

2. There were no personnel records available for the CMM Programmers. There is a process in place for training programmers, however there is no objective evidence to show what training and skill check (if any) is performed. The programmers questioned appeared to be knowledgeable in what they were doing.

While this does appear to be systemic, there are other NCR's issued relating to Competency (records). Taking into account that the there is no impact suspected, the auditor chose to classify this NCR as minor.

Environmental Controls

Example 5:

Checklist #	Paragraph #
AC7130	6.2.1

☐ Supplier to evaluate impact ☐ Systemic
☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☐ Major ☒ Minor

Identified Nonconformance:

Document WIP1-3-1 rev H para 2.3.11 for environmental controls indicates a temperature range of 66-70 degrees F is required for inspectors to utilize inspection results for acceptance/rejection purposes. The industry standard requirement is 68 degrees F. There is no objective evidence to support the temperature range defined in the procedure as being adequate to inspect hardware. When inspectors were individually questioned regarding their general understanding, they all indicated 68 degrees F +/- 2 degrees F, based on tribal knowledge within the industry.

NCR classified as Minor. It is appreciated that tribal knowledge indicates that applying 68 degrees F +/- 2 degrees would be acceptable, however this needs to be quantified as this allowance is not outlined in any specification.

Environmental Controls

Example 6:

Checklist #	Paragraph #
AC7130	6.2.1
AC7130/	9.1

☒ Supplier to evaluate impact ☐ Systemic
☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☒ Major ☐ Minor

Identified Nonconformance:

The CMM's in use at the company have not been assessed to determine if the environmental conditions affect the inspection process. The CMM's are located on the shop floor and not under any specific environmental control. For example the temperature was 23 degrees C, outside of the Industry Standard requirement (20 degrees C / 68 degrees F).

On the basis that it is not known if the environmental conditions affect the integrity of the inspection process, this NCR is classified as Major. Supplier to evaluate impact to hardware.

Validation of the Measurement System

Example 7:

Checklist #	Paragraph #
AC7130	7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.5, 7.1.6, 7.2.1, 7.2.5, 7.2.7

☒ Supplier to evaluate impact ☐ Systemic
☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☒ Major ☐ Minor

Identified Nonconformance:

The company has a process for gauge R&R, but does not have it defined in a procedure.

The methodology that is used generally appears to be satisfactory, however there were some issues noted with the process:

- CMM 1 does not have any evidence to show it was validated through gauge R&R

- The gauge R&R for the CMM 2 machine indicates that the part used was a Spacer/Stub Shaft. There was no way to identify traceability to the actual part number.

On the basis that one of the CMM's was not validated through gauge R&R, this NCR is classified as Major. Supplier to evaluate impact to hardware.

Validation of the Measurement System

Example 8:

Checklist #	Paragraph #
AC7130	7.2.7.1
AC7130/1	8.1.2

☒ Supplier to evaluate impact ☐ Systemic
☐ Non-sustaining ☐ Accepted On-Site
NCR CLASSIFICATION: ☒ Major ☐ Minor

Identified Nonconformance:

Company utilizes a Machine Checking Gauge (MCG) for CMM verification checks. This is a recent check implemented as previously the ball bar verification checks were performed. A recent MCG check for the Area 2 CMM (#3) indicated an error of 0.0005 inches above the admissible error. The machine was subject to maintenance to address the issue, then recalibrated. The recalibration was performed on Nov 6, 2011, however records show the MCG check (indicating the error) was performed on Nov 12, 2011. After further investigation by the supplier it was determined that some data entry was placed into the system that resulted in the mismatch dates.

Following this issue, it does not appear that a MCG check was performed after the calibration to verify the CMM as being operational (calibration of CMM and verification of CMM are two different aspects) or that any form of risk assessment was performed to address this issue.

Due to this situation, the NCR is classified as Major. Supplier to evaluate impact to hardware.

Software and Programs

Example 9:

Checklist # AC7130	Paragraph # 4.5.2, 4.5.3
☒ Supplier to evaluate impact ☐ Systemic ☐ Non-sustaining ☐0 Accepted On-Site NCR CLASSIFICATION: ☒ Major ☐ Minor	
Identified Nonconformance: The company uses ACME software (10.2). The contract with ACME-CMM (the equipment / software manufacturer) is such that the company receives regular software updates. There is no objective evidence available to show that the software changes / updates have been evaluated by comparing known values from the previous software version to the newest version. CMM001 (Commodore) is using 10.2.16 sp4 22MAY2013 CMM002 (Amiga) is using 10.2.20 sp 5 16AUG2013 NCR is classified as Major on the basis that it is unknown if the software updates have had an effect on the inspection process.	

Software and Programs

Example 10:

Checklist # AC7130/1	Paragraph # 6.2, 11.2, 11.5
☒ Supplier to evaluate impact ☒ Systemic ☐ Non-sustaining ☐ Accepted On-Site NCR CLASSIFICATION: ☒ Major ☐ Minor	
Identified Nonconformance: Compliance job 2 - Part #6789564-10124, work order #6584753 1. Part programs are downloaded from the server on a separate computer into a folder that can be transferred and opened by the computer used for the CMM. This program was found to be stored on the computer folder (Area 2), allowing it to be processed without having to re download, each time from a controlled source. When reviewing the folder on the CMM computer, there were other programs that had been downloaded. There was approx. 5 programs maintained in the folder and spanned a period within November, not cleaned out. The system does not automatically remove any used programs, after it has been run for the part. 2. When asking the inspector specifically about this part number, it was indicated that the program never changes and probably never will, hence using the version already in the computer. Auditor requested to see evidence that the correct program was being used. The program data indicated that for this part number, drawing sheet 2 revision E applies. When verifying the drawing from the server, it appears that it is not revision E, but revision G. 3. A similar situation identified in item 1 of this NCR was found in Area 1. However the folder appeared to hold approx. 14 part programs over a six month period. This is a systemic issue that has the potential to affect the integrity of the inspection process.	

James E. Bennett – PRI Staff

Audit Handbook

Like other commodity Task Groups within Nadcap, the M&I group has an audit handbook, albeit still under development. This handbook intends to provide technical and administrative clarifications to facilitate and standardize the audit process for M&I. It is a guide / best practice and not a requirements document. Requirements are addressed in the applicable Nadcap M&I checklists. It provides guidance, clarification and rationale to conducting an M&I audit utilizing the Nadcap M&I checklists for the Nadcap Auditor, but also the Supplier that will conduct pre-audits prior to the official Nadcap audit. Once completed, the audit handbook will be located in eAuditNet under Public Documents, Measurement and Inspection folder.

James E. Bennett – PRI Staff

Meet the M&I Task Group Vice Chair

Norman Gross is the Nadcap M&I Task Group Vice Chair who works for Supplier Quality at the Boeing Company as part of the Boeing Enterprise. Norm, as he is known, is one of only a few Boeing representatives that approve Suppliers to the Boeing Computer Aided Design (CAD) data-sets. From the M&I Task Group point of view he supports our illustrious Chair, providing leadership, guidance,

Norman Gross

neutrality, pragmatism and not to mention humor at the expense of the Staff Engineer (the humor part must be an M&I Task Group Leadership pre-requisite that I am not aware of). Here is a brief bio of Norm – Jim Bennett, PRI.

I have been working for The Boeing Company now for over 40 years, mostly relating to Measurement. I began at the age of 20 in early 1974 after graduating from high school with a little over a year of college. I spent the first four years of my Boeing career obtaining basic shop experience in sheet metal, sandblasting, painting, process line, assembly and machining before transferring into Quality Assurance as an Inspector.

As a Quality Assurance Inspector I spent the first year using bench type measurement tools to verify acceptance of sheet metal, machined parts and assemblies. The following six years involved being a CMM Operator, beginning with using a paper tape for CMM programs, with the component having to be manually aligned to the CMM axis prior to measurement. Later on I was using CMM's that could align their own axis to the part being measured. As a CMM Operator I also had the opportunity to run some of the earliest articulating arms and other portable CMS equipment.

From CMM Operator I transitioned into a CMM programming position. During my 18 years as a CMM Programmer I watched CMS equipment technology grow from simple hand coded programming language input to complex CAD interface programming. By sheer necessity I also became very familiar with and used several CAD systems (CIMLINC, CADAM, CIMCAD, CV, UG and CATIA V4 & V5). In 2002 I transferred from internal QA to Supplier Quality. Over the years I've continued to work with vendors of all types of CMS equipment to keep my knowledge base as current as possible. Along with my knowledge of CMS equipment I'm also considered by many a subject matter expert in AS9102 First Article Inspection and ASME Y14.5 Dimensioning and Tolerancing. I enjoy sharing my knowledge with our Suppliers in an effort to help them be better at what they do.

My hobbies and likes outside of work include spending quality time with my wife of 38 years, Sally, working both around our yard and remodeling our home of 35 years, camping and trail riding with our son, daughter-in-law and granddaughter.

I also enjoy traveling - preferably to warmer and drier climates than the Seattle area. i.e. Las Vegas, Mexico or Hawaii.

Norm Gross – The Boeing Company and M&I Task Group Vice Chair

Good Bye and Thank You Melanie, Hello Savannah!

Commodity Service Representatives (CSR's) are the backbone of supporting the Staff Engineers in managing the facilitation and administration of the Nadcap Program for the commodity groups. You may not necessarily meet the CSR, but will receive communication from them in regard to ballots, teleconference calls, face-to-face meetings, to name but a few. Once audits and accreditations are in place, it is likely that you will either receive a call or email from the CSR to follow up on audit reports that are late for responses or if your accreditation is about to lapse. They maintain the data that is used to obtain metrics to assess the health of the Task Group and to determine the audit projections for the number of reaccreditation audits that will take place over the coming years. Now add another Task Group to the mix. Yes, CSR's look after more than one Task Group. Melanie Petrucci who supported M&I, also supported Electronics, Conventional Machining as a Special Process (CMSP) and the Composites Task Groups.

By the time this newsletter is published, Melanie will have left the company. Melanie provided a huge amount of support to me and the M&I Task Group over the last 18 months. I would like to take this time to thank Melanie for her contribution in getting the M&I Task Group to where we are today. While

Melanie will be sadly missed by the M&I Task Group, I am pleased that she is moving into a field that she has always wanted to be in and that is the Medical Industry. She is going back to medical school to obtain her nursing degree.

Thank you for your hard work Melanie and good luck with the future!!

This brings me on to our new CSR for M&I, Savannah Garland. Savannah has an Associate's degree in Business Administration. She began working for Lifesteps, Inc. in July 2011 as an instructors assistant assisting individuals with developmental disabilities. This transitioned to a full time position as the purchasing clerk and she remained in that position until joining PRI.

Savannah Garland

Savannah is a big enthusiast of nature, preserving the environment, organic food and living a vegetarian lifestyle. Outside of work, she enjoys being around people and helping in areas that are needed. In November she will be traveling to Nepal as part of a mission team to encourage orphans and widows.

James E. Bennett – PRI Staff

PRI Staff Contact Details