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- Phil Keown
- Mark D Aubele
- James E Bennett
- Louise Belak
- Jennifer Walker

FROM THE CHAIR

The new year has brought a number of opportunities for the NDT task group and PRI Staff to "spread the word" about the Nadcap program. The NDT Management Association extended an invitation to have Mark Aubele and myself present a Nadcap Overview to their membership. This invitation was a response to the many questions posed by the membership. "What is Nadcap? What does it do? How does it impact my business?" We welcome these opportunities to work on dispelling some of the myths that continue to grow concerning "who" Nadcap really is and where the requirements originate. As is often the case when the topic of Nadcap is raised, a lot of spirited discussion took place. Many in the audience expressed their appreciation for the information that was presented, the opportunity to ask questions and an invitation was extended to return next year to provide an update. Having the opportunity to address some of the Industry Committees allows us to further the understanding of Nadcap, correct some of the misconceptions and strengthen our acceptance throughout the industry. If anyone knows of other Aerospace Industry groups who would be interested in hearing our message and discussing their perception of Nadcap, please have them contact either Mark Aubele or myself.

Baseline requirements are nearing reality. The final draft of the standards and the checklists were reviewed at the January meeting, with some great input from the supplier representatives as well as the Task Group, and will be balloted sometime early in the 2nd quarter. The goal is still to have a published standard and an operational checklist in use by the beginning of 2006. Thanks to all who have worked so hard on this initiative.

Finally, we have had a passing of the torch within the NDT task group. Keith Fightmaster, Honeywell, has stepped down as the Vice-Chair and Andy Statham, Rolls-Royce Plc has taken over. It is now his job, along with the crack team of staff engineers, to help minimize my errors and keep the task group on the straight and narrow. I want to thank Keith for the years of service he has given to the Nadcap Program, the NDT task group and to me, personally. I also hope that he will continue to support the program as a Honeywell representative. And I welcome Andy, a veteran of the program who has spent many hours trying to convert the group to a true "Queen's English" speaking gentry. Good luck, Andy!

Phil Keown – Chairman

Nadcap Meeting Schedule

	2005	2006	2007
January	—	Crowne Plaza Redondo Beach Los Angeles, CA January 23-27	TBD Phoenix, AZ January 22-26
April	Frankfurt Holiday Inn Frankfurt, Germany April 18-22	Europe TBD April 24-28	Europe TBD April 16-20
July	Holiday Inn Kensington Forum London, England July 18-22	Asia TBD July 17-21	Asia TBD July 16-20
Oct	Marriott Downtown Pittsburgh, PA October 14-20	Marriott Downtown Pittsburgh, PA October 13-20	Marriott Downtown Pittsburgh, PA October 19-26

NDT Newsletter – News to you?

Are you a new reader of the NDT newsletter? If so, here is some information:

The NDT newsletter is published four times a year, prior to the quarterly Task Group meetings. The newsletters are read by the subscribing Primes, Suppliers, Auditors and anybody that happens to click on the latest NDT newsletter on the PRI website (www.pri-network.org). The aim of the newsletter is to communicate information relating to NDT within the Nadcap program to improve our process and to promote the sharing of best practices at all levels. If you have any articles that you feel would benefit the program, feel free to forward these to one of the NDT staff engineers (contact details at the end of the newsletter) for future inclusions.

Jim Bennett – NDT Staff Engineer

National Aerospace NDT Boards and Developments in the UK

The concept of a National Aerospace NDT Board (NANDTB) was first introduced in EN4179: 2000. At this time, it was recognised that such a board was an option that could be implemented at the national level. The merging of EN4179 with NAS410, resulting in prEN 4179 : 2003 has introduced the concept of a NANDTB to a wider audience, and the reference to such a Board in EASA regulations has made it almost mandatory for each country to use the services of such a board. But what is a NANDTB and what is its role? With reference to prEN4179: 2003 and NAS410: 2003:

- A NANDTB is an independent national aerospace organisation, representing a nation's aerospace Industry that is chartered by the participating prime contractors and recognised by the nation's regulatory agencies to provide or support NDT qualification and examination services in accordance with these standards.
- A NANDTB, when used, may:
 - Provide training programs.
 - Administer procedures for qualification and certification of NDT personnel.
 - Recognise equivalencies of qualification and certification.
 - Provide general guidelines regarding facilities for NDT training, course outlines, examination questions and exam procedures.
 - Determine the depth of additional training where previous training is being taken into consideration.
 - Determine the acceptability of previous experience.
 - Designate personnel responsible for administration of eyesight tests.
 - Establishing personnel training, experience and examination requirements for 'other' NDT methods not specifically addressed by these standards.

As stated in prEN4179: 2003 and NAS410: 2003, it is not mandatory to have such a board for compliance with these standards, however European Aviation Safety Agency (EASA) Part 145(1) regulation and Acceptable Means of Compliance (AMC) 145.A.30 requires, in addition to EN4179, that all examinations should be conducted by personnel or organisations under the control of a National Aerospace Board. Where a National Aerospace NDT Board does not exist, the NDT Board of another member state should be used as defined by the competent authority. For many European Member States without a NANDTB, this has meant that newly qualified NDT personnel operating under Part 145 cannot carry out NDT tasks unless the NANDTB of another member state is used. As a consequence, several European Member States that do not already have NANDTB's are working to establishing such Boards. This situation is not replicated for NDT personnel operating under EASA Part 21(2), unless national rules and regulation dictate otherwise.

In October 2004, the UK NANDTB was launched as an independent organisation, chartered by participating prime contractors(3) and recognised by the Civil Aviation Authority. At the inaugural meeting, along with election of the Chair, Vice Chair and Secretariat (provided by the British Institute of NDT), the Board's constitution, aims & objectives, method of operation and terms of reference were agreed. The immediate priority of the UK NANDTB has been to establish a process for 'controlling' examinations administered by 'outside agencies' for NDT personnel operating under Part 145. The Board's strategy is to achieve this through recognition of Outside Agency accreditation awarded by the British Institute of NDT to 'providers' of NDT training and examinations in accordance with prEN 4179 : 2003 . The UK NANDTB will approve the accreditation scheme (which currently exists) when all of its requirements have been satisfied. The BINDT Outside Agency accreditation scheme will be subject to regular oversight by the Board.

National Aerospace NDT Boards and Developments in the UK “con’t”

For those organisations operating under Part 145 that have historically employed NDT personnel certified through the PCN aerospace sector certification scheme, which complies with EN473, the UK NANDTB is working with PCN management to revise its Aerospace sector qualification criteria in order to ensure that it fully satisfies all of the qualification criteria of prEN 4179 : 2003. This work is not expected to be complete until the end of April 2005, and for this reason the Board has conferred interim recognition of PCN certification as allowed under the (EASA) Part 145(1) regulation and Acceptable Means of Compliance (AMC) 145.A.30 that allows it to recognise equivalencies of qualification and certification and permit the continued use of PCN Aerospace certification for NDT personnel operating under Part 145.

Uppermost in the minds of the Board members has been the desire to minimise costs and bureaucracy, and to operate for the overall benefit of the UK Aerospace Industry.

The UK NANDTB is still in its infancy, but the achievements of its members to date represent real progress in such a short time. However, the Board is conscious that there remains much to do, and it looks forward to developing and implementing systems and procedures that will enable the UK aerospace industry to fully comply with the applicable regulations.

The Board recognises that, in order to ensure that the work of the Board is widely reported and understood, communication is critical. The Board has therefore established a home page on the British Institute of NDT website, where procedures, relevant documentation and meeting minutes are accessible <http://www.bindt.org/Mk1Site/NANDTBhome.html>

References:

- (1) EASA Part 145 – Implementing regulation issued by EASA for the aircraft maintenance sector.
- (2) EASA Part 21 – Implementing regulation issued by EASA for the aircraft-manufacturing sector.
- (3) Airbus UK, Agusta Westland, British Airways, BAE Systems, Bombardier, Honeywell, Messier Dowty, Rolls-Royce.

NDT of Composites Update

The NDT Task Group began work on what we now call the, “Baselines” way back in January of 2003 when a not so small group met in California to generate the first draft. Some time after that eventful meeting, the new Composites Task Group asked us to address composites directly in our NDT Checklists and Standards. I am happy to report that we have accomplished that goal.

The newest Ultrasonic Checklist, AC7114/3, and Standard, AS7114/3 were just balloted to the NDT Task Group and to Nadcap Management Council. As it applies to composites, they include references to manual and automated systems, reference standards, visual inspection requirements and discontinuity location methods. In addition, when an NDT audit is conducted of the Ultrasonic



Photograph taken of the UK NANDTB on the day of the inaugural meeting at Messier Dowty - 4th October 2004. From left to right:

Phil Berkley (Agusta Westland), Jon Biddulph (RR), John Thompson (BINDT), Mark Barker (CAA), Eric McIlroy (Bombardier Shorts), Brian Williams (BA), Stan Gane (Honeywell), John Hewitt (Airbus UK), Trevor Hiscox (Airbus UK), Keith Phillips (Messier Dowty), Chris Dootson (BAE Systems).

Jon Biddulph - Rolls-Royce Head of NDE, UK NANDTB Chairman, Nadcap Management Council Representative and NDT Task Group User Voting Member.

method, at a facility that is testing composites, at least one composite job must be run as part of the compliance inspection.

When it came to Radiography, the NDT Task Group felt that the Checklist, AC7114/4, adequately covered the possibility of composites being inspected. To ensure adequacy however, the Standard, AS7114/4, was revised slightly to address the possibility of composites and to ensure that the auditor considers that eventuality. Also, the same requirement to oversee a composites compliance job exists for radiography as it does for the ultrasonic method.

The NDT group is looking forward to the baselines, including addressing composites, being in use by the beginning of 2006.

Mark D Aubele – NDT Senior Staff Engineer

“BASELINES”, Should This Term Cause Fear and Trembling?

Filmless Radiography

Reminder to anyone having an interest in developing a Digital Radiography group within the NDT Task Group: We have had an ad hoc committee which has met via phone once with attendees agreeing that it was premature to form such a group. The Task Group Secretary communicated this. Some people came forward and voiced some opposition to this conclusion. An article was published in the January 2005 Newsletter and since publication not one single person has come forward to say we need to pursue a digital group.

I urge you to make your wishes and needs known if you feel a need for a digital radiography group in Nadcap!

Ron Rodgers

NDT RT Method Chair

Previous Newsletter Articles

Familiar with failed compliance data, the NDT failure policy, Major and Minor NCR's, etc? Agreed, this does sound negative, however it is important to understand what these are and what you can do to prevent, for example - failing an audit. It is surprisingly common that people do not fully understand some of the fundamentals to the NDT program. In a bid to address this, the NDT newsletter over the past two or so years has attempted to explain these issues and will continue to do so. It is recommended to look at previous Newsletters as they do contain valuable information. To review previous Newsletters, use the following address to direct to the NDT Commodity web page:

<http://www.pri-network.org/Nadcap/supplier/commodities/NDTesting.htm>

Jim Bennett – NDT Staff Engineer

Lets start with a little history. In or around July 2003, the Nadcap Management Council directed all Task Groups to begin to look at developing what they had termed, “Baseline Checklists and Standards”. The goal was simply to reduce redundancy and improve the overall Nadcap process. The improvement would come by reducing significantly (although not totally) the number of requirements that varied from one prime to another. This would entail a simple process (though by no means easy) of comparing each requirement and coming to agreement to ask it one time in one way for all primes, where possible. Two rules were set out as non-negotiable from the very beginning, they were; first, that the baseline effort not significantly increase cost to the supplier; and second, that the baseline not increase the duration of the audit.

Now that the history is clearer lets consider some facts. The Nadcap NDT audit from it's inception some fifteen years ago always considered the following in it's audit requirements: 1) Industry requirements; 2) Prime specific requirements; 3) Accepted practices. Each of these was considered when developing every NDT checklist and standard from the beginning. Sometimes, historically, the audit requirement exceeded what “Industry” required. As an example, if a supplier performed work for three different prime customers, he might have several requirements that exceeded what the Nadcap checklists and standards called for. The issue of course is that these requirements were not defined in the audit criteria. Not to the supplier and certainly not to the auditor. This creates ambiguity and sometimes, unnecessary NCR's. So the issue is this; the Nadcap audits were always conducted considering what the checklists and standards required, combined with industry requirements when applicable and rounded out by what each prime that work was performed for, required. Wow.

I don't know about you, but as a staff engineer and a Nadcap auditor, I have a difficult time keeping all of this straight, baselines to the rescue. What the baselines will do is take each of these requirement areas, that is, audit criteria, industry and prime requirements; and combine them into one Standard, one Checklist, and remove the ambiguity. Will this “raise the bar”? The answer to that question is, yes it will to some extent. Remember the history section above

though and what we stated in regards to the two non-negotiable rules. A requirement could not significantly increase the cost to the supplier nor could it increase the duration of the audit. In the NDT group, both of these rules were strictly adhered to. Where unanimous agreement could be reached on an issue, it was adopted. As an example, all agreed that requiring 1200 microwatts per square centimeter for the penetrant UV light intensity was an acceptable heightening of the bar. It does not significantly raise cost, and the majority of suppliers already meet this requirement. On the other hand, there is a prime that requires a 248-degree farenheight oven for drying of parts after aqueous cleaning is performed and before penetrant inspection. This is certainly a valid requirement for anyone doing work for this prime. However, it would indeed significantly raise cost for anyone not already meeting this requirement, as that supplier would likely have to purchase an oven capable of achieving the 248-degree temperature. Requirements like this then will be addressed in “Prime Specific Supplements”, but again will be clearly defined in the Nadcap audit process.

In my seven years as a staff engineer with the Nadcap program, the single most prevalent request from suppliers is this, “just tell me exactly what the requirement is and I will meet it”. Soon the baselines will be here and will constitute the Nadcap audit for NDT, and that request, will finally be answered. Every Nadcap NDT audit will include the baseline requirements that will be requirements for every single supplier audited. In addition, for your specific customers, when there are additional requirements, these will be addressed by prime supplements. Again, the critical point here is that all requirements pertaining to the Nadcap accreditation in NDT will be in black and white.

In summary then, should you have fear and trembling in regards to the baselines? The answer is a resounding no! The majority of suppliers will see little or no change in the “overall” requirement imposed on them considering the old checklist requirements combined with their own prime specific requirements. The baselines will simply make it clearer. For those few that will see an increase, it is deeply felt that these issues will add value to the Nadcap NDT audit process.

Mark D Aubele – NDT Senior Staff Engineer

Industrial Radiography Film Illuminators

This is intended to try to summarise the somewhat conflicting and confusing requirements for Film Illuminators/Viewers currently referenced by applicable specifications and to suggest a simplified approach which could be used.

First some specifications, (Standards??)

1. ASTM E1390 – Standard Guide for Illuminators Used for Viewing Industrial Radiographs
2. BS EN 25580 – Minimum requirements for industrial radiographic illuminators for non-destructive testing
3. ASTM E1742
4. ASTM E2104
5. MIL-STD-453

Second some definitions

Illuminance, of a surface – the perpendicular luminous flux reaching the surface

Luminance, of a surface – the luminous intensity emitted per unit projected area of surface. (The plane of projection being perpendicular to the direction of view)

Items 1 and 2 have the same basic requirements for Luminance, Diffusion of Light and Uniformity of Illumination. However, ASTM E1390 clearly states (in a footnote) that these requirements are intended to be satisfied by the **illuminator manufacturer**. This is not stated in BS EN 25580 and has been implemented by a number of suppliers in Europe with some difficulty as the check can take a considerable time and is not easy to carry out.

Items 3 and 5 use the same method, requiring the light transmitted through a film of known density (usually 2) to be measured and from this the maximum viewable density to be calculated from a graph. The only problem with this is that the graphs in the different standards have different scales. This I believe is a known problem, and that MIL-STD-453 is correct. This method also specifies the light level to be measured in ft candles or lux which is the unit for **illuminance**, not **Luminance**, which is measured in ft lamberts or candelas/m².

Item 4, ASTM E2104 is I believe the best method. It requires measurement of the **Luminance** of the viewing screen, in ft. lamberts or candelas/m², and then by using a supplied graph calculating the maximum viewable film density. This is based on the requirement for the minimum **Luminance** of a viewed radiograph to be 3.16ft lamberts or 10 candelas/m². It should be noted that this conflicts with Items 1 and 2 which recommend at least 30 candelas/m² be produced for films of densities less than or equal to 2.5, and 10 candelas/m² for films of densities greater than 2.5.

For spot viewers the reading is to be taken in the centre of the viewing area and for larger viewers in the dimmest section. My personal recommendation is to take readings from the centre and edges of the screen and record the maximum viewable densities in these positions. This will also give a guide to the uniformity of illumination and the useable viewing area.

As the graph in ASTM E2104 is rather small and not that easy to use a larger version may be plotted on log/linear graph paper or the minimum viewable density may be calculated from the equation for density as follows;

$$\text{Minimum Viewable Density} = \log_{10}(\text{Measured Luminance of Viewer}) \div 10$$

$$\text{or} = \log_{10}(\text{Measured Luminance of Viewer}) \div 3.16$$

The only requirement for this is a light meter which measures Luminance and not Illuminance. One used by the author is a standard light meter measuring lux, which has an attachment which is fitted over the sensor and enables Illuminance to be measured.

As an exercise I have recently made measurements of a film illuminator using the above methods with the following results;

Screen Luminance	Light Transmitted Through Film Density 2	Calculated Maximum Viewable Density		
		ASTM E2104	MIL-STD 453	ASTM E1742
2400 candelas/m ²	57 Lux (5.6ftcandles)	2.4	2.4	3.4

Whilst I cannot claim scientific accuracy the reading were made using widely-available, calibrated light meters and densitometers. They would seem to bear out that ASTM E2104 and MIL-STD-453 give comparable results and that either could be used. Also that the results from using ASTM E1742 may be a touch optimistic.

Finally, I hope that this has shed a little light (Luminance or Illuminance) on a somewhat grey area.

Graham Chapman – Nadcap NDT Auditor & Independent NDT Consultant of NDT plus

**NDT****Prime Representatives of the NDT Task Group**

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Supplier Merit

In accordance with NOP-008 "Supplier Merit Program" and NTGOP-001 Appendix 1 "Additional Requirements for the NDT Task Group" the supplier merit program awards extended frequency audits to suppliers who have successfully met the eligibility requirements. In this article we try to put in simple terms these eligibility requirements as defined by the NDT Task Group in NGTOP-001 Appendix 1.

The NDT Task Group can elect to grant a supplier an 18 month or 24 month extension to the accreditation frequency.

18 Month Extended Frequency.

For an 18 month extension the supplier must be on their 3rd consecutive audit i.e. have completed an initial audit, be on their second re-accreditation audit and;

- Have not received a product impact non-conformance in the last two audits,
- Have not received a GIDEP or a Level #2 or Level #3 Supplier Advisory issued in the last two audits,
- Have not had any non-sustaining corrective action identified in the last two audits,
- Have not had a follow up audit for this audit or the previous audit,
- Have not been issued a failure fax during the current audit review cycle in accordance with NIP-008,
- Have not had a failed compliance for the current audit deemed a potential impact by the staff engineer or the Task Group,
- Have not exceeded 100 supplier days,
- or have the Task Group vote the supplier ineligible for any other justifiable reason, the following will be considered:
 - Changes in plant ownership
 - Changes in plant location
 - Major changes in operating procedures/specifications
 - New/removal/relocation of equipment, new/elimination of processes
 - Major changes in QA management
 - Major changes in NDT personnel
 - Timely response to previous NCR's

If the supplier meets all the above criteria then their accreditation will be extended to 18 months.

24 Month Extended Frequency.

For a 24 month extension the supplier must be on their 3rd consecutive 18 month audit and;

- Have not received a major NCR in this audit,

From The First Asian Auditor

After completion of training audit last year, PRI appointed me to be an NDT auditor in April and gave me audit schedule for North America in May. PRI gave me company name to be audited and contact person's name, schedule and scope, the supplier gave me quality manual and relevant NDT procedures. That's all! American auditors do audit from this information only, no reason I can't!! Even though it was big struggle, I did it as scheduled. I appreciated with the fact that PRI treated me as same as to American Auditor. I conduct more than 10 audits in North America before starting in China, Taiwan and Singapore from September 2004. The experience in North America made me more understandable with Nadcap audit.

- Have not received seven or more minor NCR's in this audit,
- Have not received four or more minor NCR's per method in this audit,

If the supplier meets all the above criteria then their accreditation will be extended to 24 months.

Increased Scope of Accreditation and Satellite facilities.

If a supplier adds a further method to their scope of accreditation or adds a satellite facility after the Task Group have granted an extended frequency then the Task Group shall review each case and may approve or disapprove the accreditation extension.

Termination of the supplier merit.

If a supplier is on an 18 month extension and during their re-accreditation audit process, fail to meet any of the requirements for 18 month extended frequency e.g. audit performed records a failed compliance job (deemed as potential impact to hardware), then they will lose their merit and revert to a 12 month cycle. To get back on the 18 month accreditation cycle they must carry out a further two audits at the twelve month frequency and satisfy the 18 month extension requirement.

If a supplier is on a 24 month extension and during their re-accreditation audit process, fail to meet any of the requirements for 24 month extended frequency e.g. A major NCR is recorded, then they will lose their merit and revert to an 18 month cycle. To obtain their 24 month accreditation cycle they must carry out a further two audits at the 18 month frequency and satisfy the 24 month extension requirement.

If a supplier is on a 24 month extension and during their re-accreditation audit process, fail to meet any of the requirements for 18 month extended frequency e.g. audit records a failed compliance job (deemed as potential impact to hardware), then they will lose their merit and revert to a 12 month cycle. To obtain their 24 month accreditation cycle they must carry out two audits at the twelve month frequency, a further two audits at the 18 month frequency and satisfy the 24 month extension requirement.

Phil Ford – NDT Staff Engineer

Editorial Note: The aim of discussing the different procedures encountered within the Nadcap program is to reiterate the procedures that affect the Nadcap program within NDT. The procedures discussed in this Newsletter and the previous issues are all available on eAuditNet for review.

Even initial Nadcap audit's in Asia, suppliers understand the customer's requirement and established good QA and NDT system. These situations established by prime efforts. There is no doubt from the fact that many suppliers continue good relationship and communication with Prime. There is not a big difference of NDT practice between Asian and North American / European suppliers. Several Asian suppliers call ASTM the applicable specification besides customer specification. Asian suppliers are expecting to get current information through Nadcap Accreditation not only for global interpretation of specification but also Industrial Standard and better practice of NDT for improvements. They want to be top class supplier in the world as same as other area of the world.

Koichi Shimabara – PRI NDT Auditor

CSR Perspective

To some of you the CSR (Committee Service Representative) role is little known, to others maybe a little more familiar with us as part of an organization that operates in the background to ensure the program moves smoothly through the various stages of the accreditation process. For instance we are the first to touch the audit report when submitted by the auditor, and the last to touch the audit report when issuing the certificate. In between we assist the staff engineer's by making sure they are aware of information submitted by the supplier, keeping track of audits distributed between the staff engineer to maintain effective workloads, and all the while gathering data along the way to monitor the NDT metrics for our reporting internally within PRI and externally to the NDT task group and Nadcap Management Council.

One of the reports we gather information for is a breakdown of the checklist paragraphs for which the NCR's are written against. We collect this information on both current and previous audits for each supplier. At the end of each quarter this information is merged together over the period of the year, combining the total current write ups on one report and another on the previous write ups. This information gives the staff engineers and NDT task group a chance to see which paragraphs are the trouble areas for the suppliers and to address accordingly.

This information was recently made available (for the first time), to the NDT Supplier Technical Sub Task Group (NDT STSTG) which was recently approved by the NDT task group.

Louise Belak – NDT CSR

In Step with the NDT Staff Engineer

Name: P. Michael Gutridge

Title: Senior Staff Engineer (NDT/Welding)

Duties: Review audit reports, disposition corrective action responses in accordance with NDT Task Group guidelines, make Mark Aubele's life as miserable as possible without getting fired and any another assigned duties.

Background:

Began my NDT career in 1977 with a fabricator of pressure vessels (nuclear /non-nuclear), shortly thereafter moved on to an exciting, travel-filled life with an independent inspection company from 1977 until 1982, where I obtained Level 2 status in PT, MT, UT and RT. Joined Rockwell International / North American Aircraft Operations as a Procurement Quality Assurance Representative and Certified Special Process Administrator for the B-1B program, responsible for over 230 special process suppliers. In 1989 moved on (plant closed) to Douglas Aircraft Company as a Supplier Control Representative (NDT & Special Processes) on the C-17 program. Then in 1992 fate stepped in, due to a (another) plant closing, allowing me the opportunity to become one of the few and the proud... Nadcap NDT Auditors. Through strange circumstances still not totally understood, that lasted only 5 months and I was offered the position of NDT Staff Engineer for Nadcap in 1993. The rest, as they say, is history.



Certifications:

Rockwell International, Level 3 PT, MT, UT and Level 2 RT; Douglas Aircraft Company, Level 3 PT & MT; Certified Nadcap NDT Auditor in PT, MT, UT and RT. ASQ Certified Quality Auditor and former PRI Internal Audit Manager. Formerly held AWS-Certified Weld Inspector certification.

Education:

BS in Comprehensive Science (Major – Biology)

Personal:

Married with 3 grown children and 5 grandchildren. For 26 years, I have been umpiring high school baseball and fast-pitch softball. I still play co-ed slow-pitch softball and occasionally get to use my golf clubs. My biggest hobby is a Christmas tree farm situated on the 7 acres we own and live on. I am a member of the Ohio Christmas Tree Association, which has a nationally recognized annual service project that donates and ships real Christmas trees to US armed forces stationed overseas.

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