PERFORMANCE Review Institute

PRI & Nadcap Overview

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For ASTM E-01

Material Testing Laboratories Task Group

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About PRI

PRI is a global provider of customer focused solutions designed to improve process and product quality by adding value, reducing total cost and promoting collaboration among stakeholders in industries where safety and quality are shared goals.

PRI is a not-for-profit affiliate of SAE International and is led by a Board of Directors with responsibility for strategic direction and financial stability.

Established PRI Programs

Accreditation (Qualification)

Nadcap

NUCAP

Special Process, System and Product Qualification

Product Qualification

QPL

Qualified Products List is similar to Nadcap.

Focuses on Products rather than processes.

Professional Development

eQualified

Provides personnel qualification, developed and managed by industry.

eQualLearn

Improves the quality of personnel, products and processes through public and onsite training classes and memberships.

Management Systems

PRI Registrar

ANAB approved Registrar committed to improving the quality of:

Personnel, Products & Processes

AS9100, ISO9000, ISO14001

Industry Managed

Complementary

PERFORMANCE Review Institute

PRI Historical Highlights

1985	Government/Industry Equal Partner Conference identifies the need to minimize redundant process audits
1990	SAE launches PRI as a separately incorporated 501(c)6. Nadcap launched. 5 NDT audits conducted
1992	GEAE and Allied Signal mandate Nadcap to NDT supply chain. 70 NDT Audits conducted
1994	Heat Treat, Welding, Chemical Processing, Coatings, Material Test Labs added
1995	PRI Registrar created to provide QMS/ EMS in support of existing qualification programs
2000	Nadcap Europe established with U.K. office
2002	Nadcap business support software launched - eAuditNet
2003	Nadcap Asia launched
2008	PRI launches Professional Development programs
2011	Board approved exploration of new industry models: Transportation & Power Generation, Nuclear and Medical Devices.
2012	Approximately 5000 audits for all special processes across all industry-managed programs Transportation and Power Generation (TPG) Program initiated
2014	MedAccred Program initiated

Nadcap Definition

The leading, worldwide **industry-managed cooperative program** of major companies designed to manage a **cost effective consensus approach** to special processes/products and provide **continual improvement** within the aerospace industry.

Compliance – Control – Cost Savings – Risk Reduction

PRI & Nadcap Organizational Structure

Executive Leaders
- Legal entity
- Fiduciary responsibility
- Set policy
- Provide the vision

Senior quality leaders & managers
- Oversee operation of Nadcap
- Establish/implement policy & procedure
- Task group coordination & development
- Identify/develop/deploy improvement

Technical Experts
- Determine requirements
- Develop documents
- Accept corrective action
- Final decision on accreditation

Nadcap OEMs


AgustaWestland
A Finmeccanica Company
U.S. AIR FORCE
AIRBUS
AEROLIA.
AIRBUS DEFENCE & SPACE
AIRBUS HELICOPTERS
PREMIUM AEROTEC
Alenia AERONAUTICA
BAE SYSTEMS
Ball
Ball Aerospace & Technologies Corp.
Beechcraft
BOEING
BOMBARDIER
BOMBARDIER
中国商飞 COMAC
EATON | Aerospace
EMBRAER
GE Aviation
Avio aerospace propulsion
GENERAL DYNAMICS
GSA
GKN AEROSPACE
HEROUX DEVTEK
Honeywell
IAI
GROUPE LATECOERE
LIEBHERR Aerospace.
LOCKHEED MARTIN
MTU Aero Engines
NORTHROP GRUMMAN
Parker Aerospace
Raytheon
Rockwell Collins
Rolls-Royce
SAFRAN AEROSPACE · DEFENCE · SECURITY
SONACA
SPIRIT AEROSYSTEMS
TEXTRON Systems
Bell Helicopter A Textron Company
Cessna A Textron Company
THALES
Triumph Group, Inc.
UTC Aerospace Systems
Hamilton Sundstrand A United Technologies Company
Pratt & Whitney A United Technologies Company
Pratt & Whitney Canada A United Technologies Company
Sikorsky A United Technologies Company

Nadcap Accreditation Today

Special Processes

- Non-Destructive Testing
- Coatings
- Welding
- Non-Conventional Machining
- Chemical Processing
- Conventional Machining as a Special Process
- Heat Treating
- Surface Enhancement
- Materials Testing Laboratories
- Non Metallic Materials Testing
- Measurement & Inspection
- Non Metallic Materials Manufacturing

Systems & Products

- Aerospace Quality Systems
- Electronics
- Composites
- Fluid Distribution Systems
- Elastomer Seals
- Sealants

Future Processes

- Raw Materials
- Castings & Forgings

Nadcap Process Flow

- OEMs reach consensus on core audit criteria
- OEMs mandate Nadcap to supply chain as part of the supplier approval process
- Suppliers schedule and pay for the audit
- PRI contracts OEM approved Auditors who conduct on-site process audits to industry managed checklist
- Audit data is entered into eAuditNet (PRI's in-house web based audit management system)
- PRI Staff Engineers review the audit report packages and work with Suppliers to close non-conformances
- Task Groups review audit packages, identify issues and vote to grant accreditation or request additional actions
- OEMs work with PRI to measure program effectiveness and continually assess and improve Nadcap for all participants

Benefits to OEMs

- Conduct more in-depth, technically superior special process audits
- Increases number of consistent audits of the supply chain
- Establish stringent industry consensus standards that satisfy the requirements of all participants
- Identify and reduce risk of exposure to lower-quality suppliers
- Provides industry-wide early warning advisories for potential product impact and escapes (defective products)
- Provides complete visibility of supplier behaviors and transparency of audit results in a secure and retrievable format
- Program reduces costs of supply chain oversight and control
- Utilizes technically superior auditors to assure process familiarity
- Effectiveness of OEM's Quality team increased – able to look beyond baseline requirements and focus on problem areas and suppliers
- Improves flow down of industry and customer requirements to sub-tier suppliers
- eAuditNet supports procurement to identify accredited suppliers (Qualified Manufacturers List)
- Global Supply Chain managed through single real-time system (eAuditNet)

Benefits to Suppliers

- Provides routine special process audits accepted by industry
- *85% report supplier quality improvements after accreditation, including more than one-third reducing scrap rates, reworks and escapes (defective products)
- Promotes lean and continuous improvement practices, leading to higher quality and lower overall cost
- Industry accepted and consistent technical requirements leading to uniform process controls and greater operational efficiency
- Develops a structured approach to special process and product manufacturing
- Can use accreditation to increase client-base
- Opportunity to participate in development of audit criteria and program operations

*Aerospace data

Nadcap Meetings

- Nadcap has 3 meetings per year.
  - February
  - June/July
  - October – Auditor training is typically aligned with this meeting.
- Next Nadcap Meeting
  - June 23-27, 2014 Dublin, Ireland
  - October 20-24, 2014 Pittsburgh, PA USA
  - March 2-6, 2015 Berlin, Germany

Pittsburgh – London – Beijing – Nagoya – Singapore

International Headquarters

Performance Review Institute
161 Thorn Hill Road
Warrendale, PA 15086
USA

PERFORMANCE Review Institute

Material Testing Laboratories Task Group

- Implementation Date – 1993
  - First appeared in a Nadcap meeting Attendee's Guide
    - APRIL 1992
  - Years in existence – 22

MTL Vision

Materials Testing Laboratories Task Group Vision

The MTL Task Group will use technically competent, fully prepared auditors to conduct consistent, streamlined audits of subscriber requirements using audit criteria which emphasize observation of technical testing and reliance on ISO/IEC17025/AS/EN/JISQ 9100 accreditation to provide thorough oversight of technical aspects of aerospace materials testing. The TG strives to use best practices within MTL and among other commodities to reduce subscriber audits, improve inter-and intra-laboratory comparisons, enhance supplier and auditor preparation, and conduct TG business with clear goals and strong participation from all members in a well organized and documented manner.

- “Streamlined" means avoid redundancy, eliminate waste of the process, clear objectives and expectations, efficient use of time
- "fully prepared" includes proper training, pre-audit prep, personal experience
- "strong participation" means TAG (Technical Advisory Groups) quorum and support for resolution, providing TG direction with clear goals, vocal/voting participation in the meetings, effective communication with NMC

MTL Key Contacts

- Task Group Leadership
  - **Chairperson** – Tim Myers, Honeywell Aerospace,
    - Tim.myers@honeywell.com +1 602 231 1300
  - **Vice Chair** – Amanda Rickman, Raytheon
    - Amanda.rickman@raytheon.com , +1 972-670-2396
  - **Secretary** – Verl Wisehart, Rolls-Royce
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- MTL Staff Engineer
  - Kevin Wetzel, kwetzel@p-r-i.org, +1 724 772 8652 (US)
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  - Robert Lizewski, blizewski@p-r-i.org , +1 724 772 8681 (US)
- Committee Service Representative
  - Jennifer Kornrumpf, jkornrumpf@p-r-i.org , +1 724 772 8680 (US)

Current Activities MTL

- Re-organization of Nadcap MTL Documents
  - Review/Revise All MTL AC checklists for NOP-002 Compliance.
  - Development/Maintenance of MTL TG Audit Handbook
    - Implementation of the TAG (Technical Advisory Groups) process
- IPT/PTP/RR Requirements
  - The MTL Task Group is working to more thoroughly define the requirements for
    - Internal and External Proficiency Testing (requirement/frequency)
    - Acceptance of Proficiency Testing Providers
- Auditor Consistency
  - Address NMC standardization activities

Current Activities MTL

Last Meeting Activity

- **Review Subscriber responsibilities and expectations**:
  - Completed the review
  - Subscribers requested access to the slides
  - Will conduct periodic review of responsibilities in the meetings.
- **Review major activity and feedback from previous meeting**:
  - TG indicated this was a desirable activity to continue for future meetings.
  - Paris feedback indicated desire for more technical discussions and group sessions.
  - TG adopted proposal to present technical topics each full day of the meeting.
  - Group sessions planned for London meeting on MTL Vision, Checklist Vision, and getting suppliers more engaged in auditor training.

Current Activities MTL

Last Meeting Activity

- **Continue definition of MTL checklist revision process**:
  - Process was reviewed
  - Oversight Committee met
  - Process evolution to continue in next meeting.
- **Continue checklist revision for NOP compliance**:
  - Reviewed balloted AC7101/1 and prepared it for next ballot.
  - Reviewed AC7101/2 in preparations for NOP compliance and alignment with MTL Vision.
  - AC7101/1, /3, /4 planned for balloting Dec 2013.
  - AC7101/5, /6, /7, /11 planned for group work in London Feb 2014.
  - TG adopted proposal to create Handbook Supplements for each checklist which will link the new criteria to the old criteria along with applicable source requirements (satisfying NOP-002), auditor guidance, and reasons for change. Ad-hoc team was created to generate Excel files.

Current Activities MTL

Last Meeting Activity

- **TAG activity summary**:
  - TAGs reported with activity in /1, /5, /9.
  - TAG process reviewed.
- **Report on new standard creation activity**:
  - Considerable discussion about why this is needed and it might be valuable to the industry. Kick-off for activity planned for January 2014.
- **Fastener test discussion**:
  - A group led by Bryan Hall was established with an action plan to move forward.
- **Action plan to reach the MTL Vision**:
  - Group activity on segments of the Vision helped identify areas of focus toward action plans.
- **Re-test, etc discussion**:
  - Kay Fisher provided the basis for three discussions on retests, replacement tests, invalid tests, etc. resulting in Handbook definition revisions and proposed changes to the audit criteria.

Current Activities MTL

Last Meeting Activity

- **New audit checklist**:
  - Sieve analysis was accepted for new audit criteria.
  - TG opted to place the criteria in a new checklist entitled something similar to “audit criteria for physical properties evaluation”.
  - A team was established and Verl Wisehart volunteered to be the lead.
- **Heat Treat TG MOU proposals**:
  - The HT TG proposed an MOU to allow MTL auditors to audit the AMS2750 related criteria when applicable to lab furnaces not using load thermocouples.
  - MOU prepared for adoption in London Feb 2014.
- **NTGOP-001 APP MTL ballot resolution**:
  - Process for PT/IRR issues refined and TG authorized PT TAG to handle all PT/IRR matters.

Current Checklist Revision Status

- **AC7101/1F** - Completed Task Group and NMC ballot. Projected for audit after September 1, 2014
- **AC7101/2D** - Initial 45 day letter ballot to complete June 22, 2014. Then ballot comment resolution
- **AC7101/3D** – Completed 45 day letter ballot. Addressing ballot comments. The 14 day Task Group affirmation ballot then NMC ballot.

Current Checklist Revision Status

- **AC7101/4E** – 14 day affirmation ballot to conclude May 20, 2014
- **AC7101/5D** – 45 day letter ballot to conclude June 5, 2014
- **AC7101/12** – Physical Analysis - Proposed new checklist. 45 day letter ballot to conclude May 17, 2014

MTL Applicable Checklists

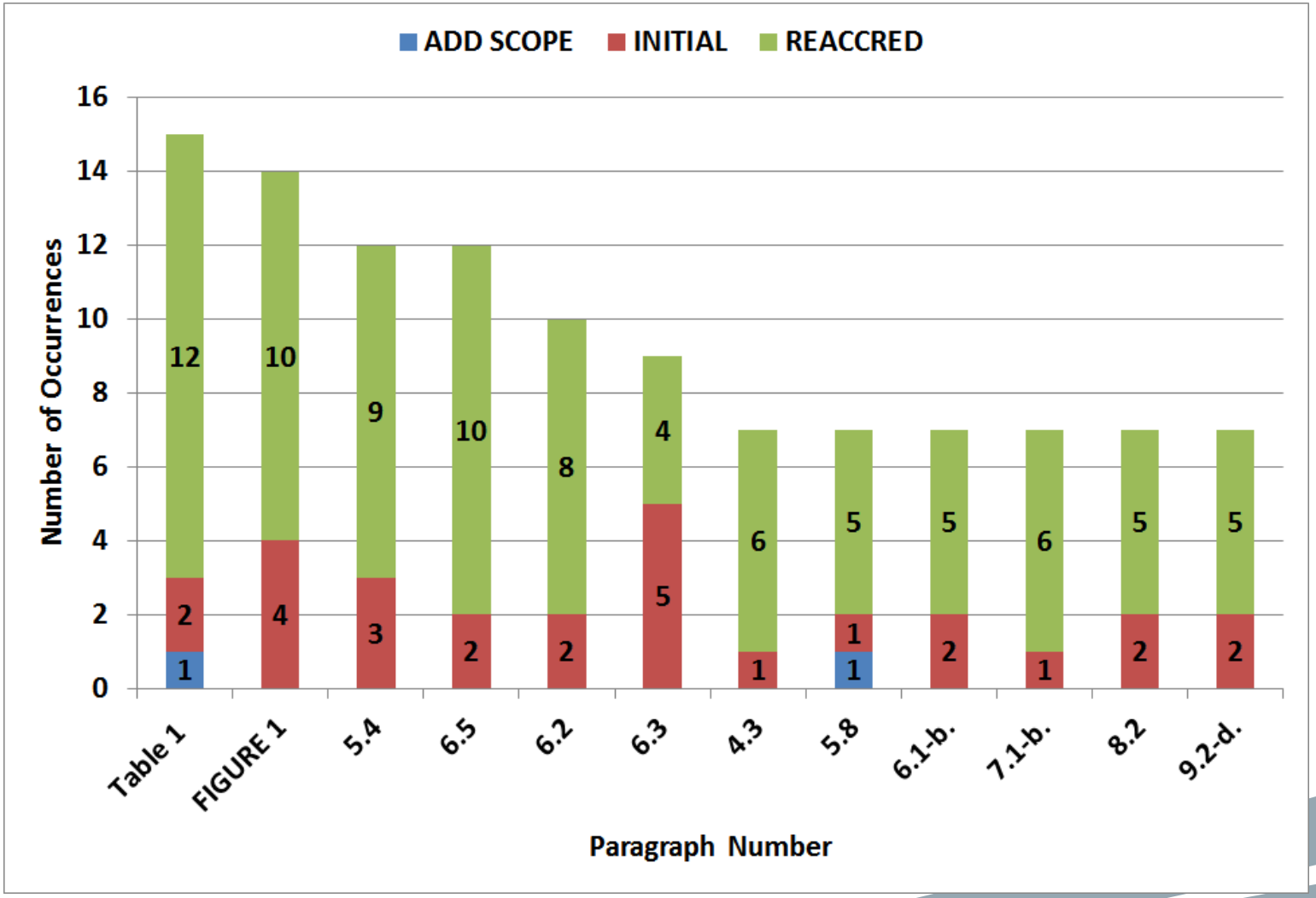
- AC 7101/2 Chemical Analysis
  - Document contains specific requirements for:
  - Atomic Emission Spectroscopy
    - DCP, ICP, Spark/Arc (OES), and Glow Discharge. High Temperature Hollow Cathode
  - Elemental (Combustion/Fusion)
    - Carbon, Sulfur, Oxygen, Nitrogen, Hydrogen
  - X-Ray Fluorescence
  - Mass Spectroscopy
    - Glow Discharge, ICP
  - Atomic Absorption
    - Graphite Furnace, Flame

MTL Applicable Checklists

- AC 7101/1 General Requirements For Materials Testing Laboratory Accreditation Program
- AC 7101/3 Mechanical Testing
- AC7101/4 Metallography and Microindentation Hardness
- AC 7101/5 HardnessTesting (Macro)
- AC 7101/6 Corrosion
- AC 7101/7 Mechanical Testing Specimen Preparation
- AC 7101/8 Differential Thermal Analysis (DTA) For Metals Only
- AC7101/9 Specimen Heat Treating
- AC 7101/11 Fastener Testing
- AC7006 Equivalent ISO/IEC 17025 Requirements

MTL Top NCRs for AC7101/2C

All Audits from January – December 2013



AC7101/2 – Overall Findings

All Audits from January – December 2013

Top NCR	Paragraph Ref	Text
1	Table 1	Cross-Testing Program
2	FIGURE 1	Chemical Laboratory
3	5.4	Analytical Equipment has demonstrated capability (precision) for each alloy family tested.
4	6.5	Reference materials used have adequate documentation. They are traceable to a recognized standards agency, natural physical constants, or they are generated or derived from standardized laboratory methods or multiple laboratory analysis programs. (This requirement includes all reference materials used to create analytical curves including those curves supplied by equipment manufacturers and used to correct percentage values sometimes called alloy type correction. Standards used only for drift correction for intensities are not included.)
5	6.2	Documented analytical data, generated by the laboratory, is on file to support the matrix, with regard to calibration range, and precision.
6	6.3	Laboratory procedures require verification of instrument calibration curves on a periodic basis and this is documented.
7	4.3	If degreed equivalent is used, justification for "equivalent" is documented and the Quality System Documents define equivalency requirements.
8	5.8	Support equipment (such as glassware, balances, etc.) is available as required in laboratory procedures.
9	6.1.b.	Equipment calibration requirements and methods are documented and are referenced (e.g. Quality Manual, Work Instructions, Standard Procedures, etc). b. Test methods are documented and detailed to provide accurate and repeatable results.
10	7.1-b.	There are written work instructions for specimen preparation. b. Preparation procedures prevent overheating of specimens.
11	8.2	Rounding for acceptance to specification requirements is performed in accordance with ASTM E 29, Rounding Method.
12	9.2-d.	The work instructions specify: d. Placement of the burns on the sample

CURRENT AUDIT CRITERIA FOR REFERENCE MATERIALS—AC7101/2 C

6.5 Reference materials used have adequate documentation. They are traceable to a recognized standards agency, natural physical constants, or they are generated or derived from standardized laboratory methods or multiple laboratory analysis programs. (This requirement includes all reference materials used to create analytical curves including those curves supplied by equipment manufacturers and used to correct percentage values sometimes called alloy type correction. Standards used only for drift correction for intensities are not included.)

a. Analytical methods utilize reference materials which have documented traceability of analysis.
b. Non-certified reference materials have documented multiple analyses against certified reference materials or wet chemical analysis
c. Calibration for testing is established using certified reference materials.
d. All reference materials used for calibration are traceable to NIST, or other nationally or internationally recognized sources.
e. For analysis methods that do not use analytical curves, calibration is performed before each test group using Certified Reference Materials.

BALLOTED AUDIT CRITERIA

AC7101/2 D

4.0	**CERTIFIED REFERENCE MATERIALS AND REFERENCE MATERIALS**			
4.1	Certified Reference Materials have documentation showing • values for each certified element • uncertainty values for each element certified OR have values for the analytical standard deviation for each element certified • metrological traceability	YES	NO	**N/A**
4.2	Analytical calibration curves are traceable to Certified Reference Materials.	YES	NO	**N/A**
4.3	Analytical methods that do not utilize calibration curves are standardized prior to use with Reference Materials.	**YES**	**NO**	**N/A**

AC7101/2 D 4.1 Guidance

4.1 Certified Reference Materials have documentation showing

- Values for each certified element
- Uncertainty values for each element certified OR have values for the analytical standard deviation for each element certified
- Metrological traceability

- Older CRM's do not carry uncertainty data. See ASTM E2857 paragraph 6.2.4.3-1 "Reference Materials (typically older ones) may be provided with certificates of analysis that do not provide uncertainty estimates for the assigned values. Some such certificates may include the tabulated results from the collaborating analysts. In that case, the standard deviation of the tabulated values may be informative as an incomplete estimate of uncertainty".

AC7101/2 D 4.2 Guidance

4.2 Analytical calibration curves are traceable to Certified Reference Materials

- Certified reference materials are not always available for every point and range of every calibration curve. Therefore there are points on calibration curves that will be established using well-characterized (known) materials. This audit criteria is not meant to exclude the use of other materials in establishing calibration curves. The key point is that the curve has traceability to certified reference materials generally, and not that each point on the curve is directly attributable to a CRM. Objective evidence of a suitable calibration curve can be seen in the PTP results as well.)

AC7101/2 Figure 1 Laboratory Capability Matrix

2.1	Chemistry Laboratory Matrix (Figure 1) is completed for all types of chemical analysis within the scope of accreditation. • Chemistry Matrix information for Figure 1 is described in Appendix A. • An example of a Chemistry Matrix is provided in Appendix A. • Figure 1 summarizes analytical capability, precision and calibration range. • The data listed in Figure 1 (including range and precision) is generated by the laboratory, using applicable equipment, and is documented. • The use of the instrument manufacturer's data for Figure 1 is prohibited. • Figure 1 must be completed for each element per test code for each alloy family within the laboratory scope of accreditation.

AC7101/2 D 2.1 Guidance

- This audit criteria provides objective evidence for Figure 1 and for test method validation. The auditor need only review a sampling of this data. It is not necessary to review data for every element for every test code.
- For an initial audit and any add scope audits, It is recommended that Figure 1 is reviewed thoroughly. And on any reaccreditation audits the auditor would review a sampling of the data and any changes.

Material Testing Laboratories Task Group

Questions

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