



# TTCAA Advisory CIRCULAR

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**SUBJECT: Training, Qualification and Certification of Non-Destructive Testing (NDT) Personnel**

**Document Number: TAC-016**

**Date: 4<sup>th</sup> October, 2013**

## **1. PURPOSE**

1.1 This Trinidad and Tobago advisory circular (TAC) contains recommendations for the experience, training, qualifying, examining, and certifying of non-destructive testing personnel for inspection of aircraft, engines, propellers, accessories, and components.

1.2 It recommends criteria for qualification of personnel requiring appropriate knowledge of the technical principles underlying the non-destructive tests they perform. This document applies to those individuals directly responsible for the technical adequacy of the NDT methods used, as well as those persons or organizations providing training, supervision, or oversight of NDT personnel.

1.3 Organizations should have a written program describing the guidelines used to train, qualify, and certify personnel. Inspection personnel qualified under any of the systems described in paragraph 4 is eligible to perform NDT in accordance with the aircraft manufacturer's instructions.

1.4 This TAC was developed from the FAA Advisory Circular AC 65-31A.

## **2. DISCUSSION**

### **2.1 Qualified NDT Personnel**

- (a) Non-destructive testing is defined as inspections, tests, or evaluations which may be applied to a structure or component to determine its integrity, composition, electrical or thermal properties, or dimensions without causing a change in any of these characteristics. Qualified personnel are required for reliable performance of non-destructive testing.
- (b) Both the performance of tests and the interpretation of results require skill and must be accomplished by trained personnel. They must know the applications and limitations of the various non-destructive testing methods used to locate defects in aircraft structure and components.

- (c) Persons performing non-destructive testing, inspection, or evaluation may be qualified in accordance with one or more of the standards listed in paragraph 4. Other qualification documents acceptable to the Authority may be used when they are included in the approved manual for the organization specified in the contractual document between the user of the NDT services and their provider.
- (d) The applicable revision should be the latest unless otherwise specified. Qualification should be based on an examination and/or other demonstration of proficiency, competence, and experience, as set forth in the relevant documents.

2.2 Scope of Examination.

The scope of the examination is called out in paragraph 8.

2.3 Timing of Examination.

The timing of the examination should be in accordance with paragraph 9.

2.4 Records and Documentation of Administrative Practices.

An organization's records should include a description of the details to be recorded for each qualified individual and identification of those responsible for developing, administering, and maintaining the organization's qualification program.

2.5 Requalification Requirements.

Requalification requirements should include re-examination of employees. It should also include the conditions and requirements for the revocation and reinstatement of qualification of individuals and the documentation thereof.

**3. DEFINITIONS.**

Terms included in this document are defined as follows:

“Acceptance Criteria (Pass/Fail)” means the basis for acceptance of the results of an examination as noted in paragraph 8;

“Certification” means the written testimony of qualification;

“Certification Based on Previous Experience” means the certifications acceptable to the Authority of individuals who were certified under a previous qualification program;

“Documented” means the condition of being or existing in written or electronic form (an example is ATA Specification 105, Air Transport Association, Guidelines for Training and Qualifying Personnel in Non-destructive Testing Methods, available on compact disk; or CARs Part V, subparts 71 and 73, subsection 571.02(3), Schedule I-Personnel Certification for Non-destructive Testing (NDT).)

“Evaluation” means a determination of the significance of indications;

“Examination” means a formal, controlled, documented interrogation conducted in accordance with a procedure defined in an organization's documentation program;

“Examiner” means a Level III or other qualified representative of the examining organization;

“Experience” means an actual performance or observation conducted in the work environment, resulting in the acquisition of knowledge and skill. This does not include classroom or laboratory training but does include on-the-job training (OJT);

“General Examination” means a written examination addressing the basic principles of the applicable NDT method;

“Grandfathered” means certification of individuals who are considered qualified under a prior qualification program. This option can only be used once to start a new program;

“Indication” means the observation, or evidence of an observation, occurring during a NDT or test;

“Inspector” means a qualified individual designated by an organization to provide inspection services;

“Instructor” means an individual qualified and designated, in accordance with this standard, to provide classroom or laboratory training for NDT personnel. The instructor should have the necessary skills and knowledge to plan, organize, and present classroom, laboratory, or OJT programs of instruction in accordance with approved course outlines and in the method for which qualified. The instructor should be thoroughly familiar with the theory and practical applications of the method as utilized by the organization. The instructor should not conduct NDTs for the acceptance of parts unless he/she is properly qualified.

“Interpretation” means the determination of whether indications are relevant or non-relevant;

“Method” means one of the disciplines of NDT, or testing (e.g., radiography, ultrasonic), within which different techniques exist.

“On-The-Job Training (OJT)” means training in the work environment in learning instrumentation setup, equipment operation, recognition of indications, and interpretation under the technical guidance of an experienced Level II, Level III, or other designated individual;

“Organization” means a corporation or other similar entity established to provide or receive NDT services;

“Outside Agency” means an independent body under contract for NDT services which may include the training and examination of personnel to the requirements of a standard. Consultants and self-employed individuals are included in this definition;

“Practical Examination” means the examination used to demonstrate an individual’s ability to practice the NDT methods that will be performed for the organization. Questions and answers need not be written, but observations and results should be documented;

“Procedure” means a detailed, written instruction for conducting NDTs or qualifying personnel;

“Qualification” means demonstrated skill, training, knowledge, and experience required for personnel to properly perform the duties of a specific job;

“Qualification Certificate” means a certificate issued by the organization as evidence of qualification to NDT proficiency standards as defined in this document;

“Qualified Personnel” means personnel qualified to perform NDTs in accordance with, and covered by, provisions of this document;

“Specific Examination” means the written examination to determine an individual’s understanding of procedures, codes, standards, and specifications for a given method used by the organization.

“Technique” means a procedure within a method. For example: ultrasonic immersion testing used as a part of the ultrasonic method, or fluorescent penetrant inspection as a part of penetrant inspection.

“Trainee” means an individual participating in a training program for an NDT method who is not yet qualified. Trainees should obtain work experience only under the direct supervision of a Qualified Instructor, Level II or Level III in the same method. Trainees should not independently conduct tests; make, accept, or reject decisions; or perform any other NDT functions.

“Training” means an organized and documented program of activities designed to impart the knowledge and skills necessary for qualification. This program may be a mix of classroom, laboratory, OJT, and programmed self- teaching.

#### **4. STANDARDS FOR QUALIFICATION, CERTIFICATION, AND TRAINING OF NDT PERSONNEL.**

4.1. Individuals who will provide equivalent competency to ensure satisfactory maintenance as set forth in relevant aviation regulations should:

- (a) have knowledge and experience gained while attending schools with curricula developed in accordance with standards acceptable to the Authority and published in the relevant approved manuals;
- (b) have OJT training with an appropriately certified organization; and c) meet the criteria set forth in the following list of acceptable standards:
  - (i) AIA-NAS-410, Aerospace Industries Association, National Aerospace Standard, NAS Certification & Qualification of Non-destructive Test Personnel
  - (ii) ATA Specification 105, Air Transport Association, Guidelines for Training and Qualifying Personnel in Non-destructive Testing Methods
  - (iii) PCN/GEN/92, General Requirements for the Certification of Personnel Engaged in Non-destructive Testing at Levels 1, 2 and 3. (PCN Certification Services, British Institute of NDT, 1 Spencer Parade, Northampton NN1 5AA, UK)
  - (iv) Canadian National Regulations contained in CAN/CGSB-48.9712-95, Qualification and Certification of Non-destructive Testing Personnel
  - (v) International Standards Organization (ISO) document 9712, Non-destructive Testing— Qualification and Certification of Personnel
  - (vi) NAS-410 (replaces MIL-STD-410E), National Aerospace Standard, Non-destructive Testing Personnel Qualification and Certification

4.2 Individuals meeting the criteria established by the following certification programs may be deemed qualified after a review by the Authority of the specific written practice establishing certification criteria.

- (a) American Society for Non-destructive Testing, Inc. (ASNT), Recommended Practice SNT-TC-1A - Personnel Qualification and Certification in Non-destructive Testing.

*NOTE: This document is intended as a guideline for organizations to establish their own written practice for the qualification of Non-destructive Testing Personnel. It is not intended to be used as a strict specification.*

- (b) Certain International NDT standards accepted by other approved regulatory agencies and national certification programs may be considered to be acceptable standards. In particular, European standard EN 4179, Qualification and Approval of Personnel for Non-destructive Testing (dated January 1995) is acceptable.

4.3 Other standards or alternative methods of qualification and certification may be satisfactory if found acceptable by the Authority.

4.4 Qualifications may be established by completing the qualification, examination, and re-examination requirements described in paragraphs 6 through 9 and TTCAR No. 1, 5 and 6.

## **5. NON-DESTRUCTIVE TESTING METHODS**

Qualification of personnel in accordance with this TAC should be applicable to the following methods:

- 5.1 Radiographic (RT)
- 5.2 Magnetic Particle (M71)
- 5.3 Ultrasonic (UT)
- 5.4 Liquid Penetrant (PT)
- 5.5 Eddy Current (ET)

*NOTE: Methods other than those listed above, such as acoustic emission, neutron radiography, leak testing, thermography, holography, computed tomography, or any other NDT method that can be used for inspection of aircraft, engines, accessories, or components may be added if they become broadly applied within the organization and guidance exists as to their application. For example, if infrared or shearography become the subject of manufacturer's Service Bulletins, assurance that only qualified individuals perform those inspections will be required by the Authority.*

## 6.

## QUALIFICATIONS

### 6.1 Training, Experience, and Credentials

To properly perform the necessary tasks, NDT personnel should have appropriate training and experience and, when required by the qualifying organization, hold a valid and current Aircraft Maintenance Engineer Licence. Instructors are exempted from the necessity to hold such certificates unless specifically required by the qualifying organization. Possession of an Aircraft Maintenance Engineers Licence may be considered part of the required training experience.

### 6.2 Competence

NDT personnel should be qualified to direct and perform inspections in the method required. The individual should also be able to set up and calibrate equipment (where applicable), read and interpret indications, and evaluate them with reference to applicable standards and specifications. The individual should be thoroughly familiar with the scope and limitations of the methods and should have the ability to apply detailed techniques to products or parts within the limitations of the qualification requirements. The individual should further be able to organize and report non-destructive inspection results in a manner specified by his or her organization.

### 6.3 Certification

A certificate may be issued by the organization as evidence of qualification. This Qualification Certificate may define the level of qualification based on the requirements listed below. There are three basic levels of personnel qualification: Level I, Level II, and Level III. These levels may be further subdivided for specific operations, when appropriate:

#### Levels of Qualification

(a) Level I Special (Optional)

Level I Special is the lowest qualification level and is task specific. Personnel may be qualified to this level to perform a specific task on a particular component. Classroom instruction and OJT may be limited to the specific requirements to perform the task. Written evidence of qualification should be limited to a specific task. An example of this level is the Eddy Current Inspection of aircraft wheels.

(b) Level I for a specific method.

To be qualified for Level I, an individual should have the skills and knowledge to perform specific tests, specific calibrations, and specific interpretations and evaluations for acceptance or rejection, and to document the results in accordance with specific procedures. The individual should:

- (i) be knowledgeable of any necessary preparation of parts before or after inspection;
- (ii) be able to follow procedures pertinent to the techniques for which he/she is qualified;
- (iii) receive the necessary guidance or supervision from a qualified Level II, Level III, or other designated individual, and 4) meet the training and experience guidelines in Table 1.

**TABLE 1. MINIMUM CLASSROOM TRAINING AND EXPERIENCE REQUIREMENTS**

NDT METHOD	LEVELS		
	CLASSROOM INSTRUCTI	EXPERIENCE (HRS/MO.) (3)	
		All Levels	Level I
EDDY CURRENT	40	480/3 mo. [1,4]	1440/9 mo.
ULTRASONIC	40	480/3 mo. [1,4]	1440/9 mo.
MAGNETIC PARTI	16	160/1 mo. [1,5]	480/3 mo.
PENETRANT	16	160/1 mo. [1,5]	480/3 mo.
RADIOGRAPHY	40	480/3 mo. [1,4]	1440/9 mo.

*NOTES:*

1. *To be qualified a trainee must complete the required classroom training and fulfill the requirements in paragraph 8, Examination.*
2. *A Level I may be upgraded to Level II after satisfactory completion of required experience in method.*
3. *Initial experience may be gained simultaneously in two or more methods if:*
  - (a). *The candidate spends a minimum of 25% of work time on each method for which evidence of qualification is sought, and*
  - (b). *The remainder of work time claimed as experience is spent in NDT-related activities defined in the employee's written practice.*
4. *During the first 90 days, the individual should independently accomplish only procedures for which he/she has previously been qualified by OJT. Documentation is required.*

(c) Level II.

In addition to the requirements specified in the Level I qualification, the individual qualified to Level II should have the skills and knowledge to set up and calibrate equipment, conduct tests, and to interpret, evaluate, and document results in accordance with procedures in all techniques in the methods used by his or her organization. The individual should be thoroughly familiar with the scope and limitations of the methods for which he/she is qualified and should be capable of providing OJT for trainees and other inspectors. He or she should be able to organize and document NDT results and should be familiar with the codes, standards, and other regulatory documents which control the method used by the organization. The individual should meet the guidelines in Table 1.

(d) Level III.

In addition to the requirements specified in the Level II qualification, individuals qualified to Level III should have the skills and knowledge to interpret codes, standards, and other regulatory documents that control the methods used by the organization. The individual should be able to select the method and technique for a specific inspection, select and/or design equipment and reference standards, and verify the adequacy of procedures. Only individuals at this level should have the authority to approve procedures for the methods for which they are qualified. The individual should also have general knowledge of all other NDT methods utilized by the organization. Level III qualified individuals should be capable of

conducting or directing the training and examination of personnel in the methods for which they are qualified.

## **7. REQUIREMENTS FOR QUALIFICATION.**

7.1 The organization should establish a written program for the control and administration of personnel training, examination, qualification, and documentation. This program should include a method for maintaining proficiency, including recurrent training and steps to decertify, retrain, or recertify as required.

7.2 The organization should provide qualified instructors who have satisfactorily completed an approved NDT program for the applicable testing method. Such individuals should have demonstrated practical experience and knowledge of the subject. At the option of the organization and as provided in their written procedure, a qualified outside agency may be engaged to provide NDT training, qualification, and testing.

7.3 To obtain a Qualification Certificate, personnel should have completed sufficient organized training to become familiar with principles and practices of the applicable test method. The training program should include on-the-job instructions in basic principles, products, equipment, operating procedures, test techniques, and review and analysis of inspection/test data that the individual will encounter in his/her work assignment.

7.4 Qualification of personnel should be based on demonstration of satisfactory performance as determined by procedures outlined in paragraph 8, Examination. To be considered qualified, a candidate should satisfy one or more of the following criteria for the applicable NDT skills:

- (a) Level I, SPECIAL. Initial classroom hours and OJT experience should be sufficient to qualify an individual for a specific task. To be qualified, the individual must meet the requirements of paragraph 8, Examination.
- (b) Level I/Level II. Table 1 lists the required classroom training hours and OJT/experience and testing requirements to be used in establishing written practices for initial qualification to Level I or Level II.
- (c) Level III. In order to qualify for Level III, a candidate, at a minimum, should:
  - (i) Have graduated from a minimum four-year college or university curriculum with a degree in engineering or a related science, plus one year minimum experience in NDT testing in an assignment comparable to that of an NDT Level II in the applicable NDT method(s); or
  - (ii) Have completed two years of engineering or related science study at a university, college, or technical school, plus two years' experience in assignments at least comparable to that for NDT Level II in the applicable NDT method(s); or
  - (iii) Have four years' experience in an assignment at least comparable to that of an NDT Level II in the applicable NDT method(s).



## 8.

## EXAMINATION.

This section outlines examination guidelines for Levels I, II, and III. The examination should consist of demonstrations in the following five segments to confirm physical and technical qualification:

### 8.1 Required Examinations.

- (a) Physical Examination.
  - (i) Vision.  
An examination to assure near vision of at least one eye, corrected or uncorrected, such that the individual can read Snellen equivalent of 20/20 (Jaeger #1). The examination must be on a periodic basis, not to exceed one year.
  - (ii) Color Perception.  
Distinguish and differentiate between colors necessary for the inspection method for which evidence of qualification is sought.
  - (iii) Physical Requirements.  
The physical requirements established by the organization as a condition of employment will normally suffice.
- (b) General Skills Examination.
  - (i) The general examination for all skill levels should be a closed-book examination consisting of questions that cover the basic inspection/test principles relative to the applicable method, equipment, operating procedures, and techniques that the individual may encounter in his or her assignment.
  - (iii) In preparing the examination, the organization should select pertinent questions covering the applicable method. A minimum of 40 questions should be used for the general examination and should cover reading and interpreting findings (indications), knowledge of standards, etc.
  - (iii) The examination should also cover the specifications and/or standards used by the organization in its non-destructive inspection procedures.
  - (iv) Relevant standards and documentation upon which the examination is based should be available in both English and the language used in the documentation for which evidence of qualification is sought. The examination should be in English.
- (c) Practical Examination (Classroom). As part of the classroom training, the individual being considered for qualification should satisfactorily demonstrate that he/she is familiar with and can operate the necessary test equipment and interpret the resultant information to the degree required by the Level III instructor.
- (d) Practical Examination (OJT Shop). This experience should be accomplished in the shop area on actual components under normal working conditions. The hours of OJT training are defined in the experience section of Table 1. Only personnel who have demonstrated that they possess the required knowledge and ability to meet Level II or Level III requirements should be

considered qualified. Such demonstration should include a demonstration of proficiency on test samples related to tasks identified by the qualifying organization.

- (e) Acceptable Certification. Upon satisfactory completion of the required physical and general skills examinations; the classroom and OJT shop practical examinations, as outlined above; and receipt of a qualification certificate from the appropriately certified organization as described in paragraph 4 above, an individual is then considered to have NDT certification acceptable to the Authority.

## 8.2 Grading of Examinations.

- (a) A Level III or other qualified examiner as provided for in the organization's written program should conduct and grade or evaluate the qualification examinations for each level.
- (b) Examinations administered for qualification should result in a composite grade of at least 80%, with no individual examination having a grade less than 70%.

## 8.3 Acceptance Criteria.

If acceptance criteria (e.g., reference radiographs, test samples) are not included in a standard or procedure, they should be provided as a part of the examination.

## 8.4 Re-examination.

Candidates failing the examinations may be given time for additional studies and be re-examined at the discretion of the organization, and as provided in the organization's written program. The re-examination should not utilize the same questions, test samples, or indications that were used in the initial examination.

# 9. **REQUALIFICATION/RECURRENT TRAINING.**

9.1 Requalification examinations should consist of a demonstration of proficiency in the procedure for which the applicant is being examined. Requalification should occur, at a minimum, every three years. Personnel should be required to be retrained or re-examined and their qualification certification continued or revoked in accordance with the organization's written program and at the discretion of the organization when an individual:

- (a) Demonstrates unsatisfactory performance, or where data indicates that performance of an individual is unsatisfactory. Unsatisfactory performance may be determined by the responsible person from the organization who originally qualified the individual or by some other documented method approved by the organization.
- (b) Has been inactive in the method for a six-month period or other shorter interval as provided in the organization's written program.
- (c) Fails to be evaluated for compliance with performance standards by a Level III or other designated individual at an interval not to exceed two years.
- (d) The time limits of this paragraph have expired.

**10. RECORDS.**

- 10.1 The organization should maintain appropriate personnel training records in accordance with their qualification program for as long as the NDT inspector's Qualification Certificate is in effect.
- 10.2 Records must be available for audit by authorized personnel, and should at a minimum specify the date, time, and place of certification; and the employing organization, along with the particular details applying to the certificate holder (such as Level, special qualifications or limitations, and standards under which the holder is certified).
- 10.3 In addition, the records must include a copy of any authorisations or specifications issued to the organization by the Authority.

**Approved by:**

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