



Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular

AC43-13

Non-Destructive Testing (NDT)

Original

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GENERAL

Civil Aviation Safety Authority Advisory Circulars (AC) contain information about standards, practices and procedures that the Director has found to be an **Acceptable Means of Compliance (AMC)** with the associated rule.

An AMC is not intended to be the only means of compliance with a rule, and consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices or procedures are found to be acceptable, they will be added to the appropriate Advisory Circular.

This Advisory Circular also includes **Explanatory Material (EM)** where it has been shown that further explanation is required. Explanatory Material must not be regarded as an acceptable means of compliance.

PURPOSE

This Advisory Circular provides methods, acceptable to the Director, for showing compliance with the requirements of Rule 43.66 relating to Non-Destructive Testing and provides explanatory material to assist in showing compliance.

RELATED CAR

This AC relates specifically to Civil Aviation Rule Part 43.66.

CHANGE NOTICE

This AC is the Original and there is no change notice.

APPROVAL

This AC has been approved for publication by the Director of Civil Aviation.

TABLE OF CONTENTS

1. INTRODUCTION	3
2. PURPOSE	4
3. APPLICABILITY.....	4
4. DEFINITIONS	4
5. QUALIFICATION STANDARD FOR NDT PERSONNEL	5
5.1 AMC 43.66(a) Qualification of Person Performing NDT Personnel	5
5.2 AMC 43.66(b) Written Practice	5
5.3 AMC 43.66(a) Nominated NDT Level 3 Person.....	6
5.4 AMC 43.66(a) NDT Personnel	6
5.5 AMC 43.66(a) Visual Acuity.....	6
6. NDT INSPECTIONS	7
6.1 AMC 43.66(b) NDT I.A.W NDT Written Practice	7
6.2 AMC 43.66(b) Approval of NDT Procedures.....	7
6.3 AMC 43.66(b) Certification of NDT Inspections.....	7
6.4 AMC 43.66(b) Subcontractors Providing NDT Services	8

1. INTRODUCTION

Civil Aviation Rule 43.66 requires that a person performing maintenance on an aircraft or aircraft component that involves the use of specified non-destructive test (NDT) processes to be appropriately qualified and to use appropriate methods, techniques and practices. PNG relies on original equipment manufacturers (OEM) to specify appropriate methods, techniques and practices acceptable to the Director in their NDT manuals for the conduct of maintenance. PNG also expects Part 145 aircraft maintenance organizations to nominate a Level 3 NDT person who can review and approve their NDT procedures and practices in accordance with OEM NDT procedures.

Some manufacturers have amended their NDT procedures. For example, Lycoming have removed their magnetic particle inspection procedures from the Service Bulletin and replaced them with the requirement for the overhauler to write the procedures and have them approved by a Level 3 NDT person. The expectation in instances like this is that the overhauler (or a subcontractor) will have a system in place that is capable of establishing an approved NDT procedure. These factors have combined to expose an inattentive approach to NDT systems in the smaller workshops.

CASA PNG issues an Aviation Maintenance Specialist (AMS-2) Certificate under Part 66 Subpart D to appropriately qualified and competent NDT Specialists. The qualification and competence of NDT inspectors relies on a robust and strictly controlled NDT certification system which already exists in the NDT industry in the form of published standards such as the NAS Certification & Qualification of Non-destructive Testing Personnel standard (NAS 410) and the European standard EN 4179. A CASA PNG AMS-2 Certificate simply validates this Industry NDT Qualification and serves as an entry control certification for entry into the Aviation Ball Park.

CASA PNG also certifies Part 145 organisations to employ, engage or otherwise contract NDT Specialists to conduct NDT inspections on aircraft or aircraft components under their P1-rating and in accordance with procedures in their Exposition.

This AC (AC) restates the requirement of rule 43.66(2) that NDT must be performed using appropriate methods, techniques and practices acceptable to the Director. The objective of rule 43.66 is to establish a minimum standard for non-destructive testing where NDT is required to ensure the continued airworthiness of aircraft and aircraft components.

Rule 43.66 prescribes requirements for both the personnel performing NDT and the processes used. These requirements are that —

- persons performing NDT meet a level of qualification, training and experience acceptable to the Director
- NDT is performed using methods, techniques and practices acceptable to the Director.

Non-destructive testing by nature is a critical process since an NDT procedure cannot easily be independently checked other than by repeating the procedure. It also makes up a very small proportion of maintenance activity; so from a CASA PNG perspective, confidence in the integrity of NDT activity must rely on controls in the form of certification/approval to an acceptable standard.

These standards require that NDT inspectors are appropriately qualified, experienced and certified. The management systems that support the standard will ensure that the competency of NDT personnel is properly established and maintained.

The standard adopted in this AC is NAS 410 (NAS Certification & Qualification of Non-destructive Testing Personnel). It is acceptable to the Director, is in common use, and has been harmonised with the European standard EN 4179.

NDT is a maintenance activity called up by the aircraft or component manufacturer or by an airworthiness directive, and as such is subject to the requirements of the Civil Aviation Rules in respect of the performance, certification and recording of maintenance.

The requirements of rule 43.66 are in addition to other requirements in Part 43 regarding the performance of maintenance – for example rule 43.51 regarding persons who may perform maintenance on an aircraft or component.

As a maintenance activity NDT is also subject to requirements that the manufacturer's instructions are followed or any deviation to the manufacturer's instructions are duly authorized.

2. PURPOSE

The purpose of this AC is to publish what is acceptable to the Director when considering the certification, methods, procedures and practices when performing NDT.

The term NDT is used throughout this document to include, but not be limited to, the following inspection methods:

- liquid penetrant (PT)
- magnetic particle (MT)
- eddy current (ET)
- ultrasonic (UT)
- radiographic (RT)
- Other recognized inspection methods identified by the applicable standards.

3. APPLICABILITY

This AC applies to any person or organisation providing NDT services, either directly or as a subcontractor to – an NDT provider, a maintenance provider, an aviation end user such as a manufacturer, an aircraft operator, or an aircraft owner.

This AC does not apply to the colour contrast dye penetrant ("red dye") inspection method. Dye penetrant inspections may continue to be performed by aircraft maintenance engineers without the requirement for documenting the organisation or individual's NDT procedures or processes that are the subject of this AC.

Note: Aircraft maintenance engineers performing colour contrast penetrant inspections should meet the visual acuity requirements specified in section 5.5 of this AC.

It should further be noted that where an aircraft manufacturer includes in its maintenance schedule the requirement to perform a colour contrast or visible dye penetrant inspection, the maintenance organisation or individual should exercise control over the process. This should take the form of training (to provide an adequate and uniform level of knowledge of the process to meet the aircraft manufacturer's inspection requirement), procedures (to provide uniformity of performance), and visual acuity (refer section 5.5 of this AC) and colour perception testing.

4. DEFINITIONS

For the purposes of this AC, the following definitions apply:

Authorisation (of NDT personnel) means a written statement, in the form of a certificate, issued by a Nominated Level 3 person based on an individual's competence in relation to the activity specified within the certificate.

Authorisation (of NDT procedures) means the act of certifying approval of NDT procedures by a Nominated Level 3 person.

Certificate means a document issued in accordance with the NDT standard being used indicating that the named person is competent to perform the specified non-destructive testing and has met the requirements of the standard.

NANDTB means National Aerospace NDT Board and is a body, represented by a nation's aero-industry, chartered by participating prime aerospace contractors, and recognised by the national authority.

NDT instruction/technique means a written description of the precise steps to be followed in testing to an established standard, code, specification or NDT procedure. **NDT method** means one of the disciplines of non-destructive testing that utilises the application of a physical principle (e.g. ultrasonic method).

NDT procedure means a detailed written description of all essential parameters and precautions to be observed when applying an NDT technique to a specific test, following an established standard, code or specification.

NDT provider means any person or organisation providing a primary NDT service to an end user or customer.

Nominated Level 3 person means a Level 3 certificate holder responsible to the Chief Executive or Accountable Manager for the airworthiness aspects of NDT work undertaken by that NDT provider.

Qualification means the ability of NDT personnel to meet the requirements of a given specification in terms of physical requirements, training, knowledge and experience necessary to perform the applicable NDT method.

Qualification examination means an examination administered by an independent certifying body (e.g. NZ CBIP), or by a body authorised within the employer's NAS410 compliant written practice, which demonstrates the general, specific and practical knowledge of the candidate.

Type Certificate means, for the purposes of this AC, Type Certificates and Supplementary Type Certificates issued in accordance with Part 21.

Written practice refers to written procedures relating to NDT activities undertaken by an NDT provider. This may be a separate manual, or form part of an organisation's wider exposition or procedures.

5. QUALIFICATION STANDARD FOR NDT PERSONNEL

5.1 AMC 43.66(a) Qualification of Person Performing NDT Personnel

When considering acceptability of qualification and certification of NDT personnel, NDT providers should comply with the requirements of the latest issue of NAS410. This standard requires NDT providers to have and maintain a written practice which is required to include procedures for the authorisation of NDT personnel and the performance of NDT activities.

Where an NDT provider's written practice recognises NZ CBIP, or any other recognised external certification for its personnel, the NDT provider's procedure for issuing an authorisation based on the certification, and the certification itself, will be acceptable to the Director for complying with rule 43.66(1).

Note: The NANDTB of Australia was established to satisfy the requirements of Australian Standard AS 3669 and is accepted by CAANZ as meeting its requirements as a board described in NAS410 and EN4179. Conversely, a person's certification gained within one NDT provider's organisation under the provisions of NAS410 (or other standards such as EN4179, ATA105, ISO9712, SNT-TC-1A, etc) cannot be accepted by another NDT provider's organisation unless the person's certification is reviewed and approved by the organisation's nominated Level 3 person.

5.2 AMC 43.66(b) Written Practice

The written practice required under NAS 410 needs to be part of the NDT provider's exposition or management system and needs to describe how the NDT provider meets the requirements for:

- training, qualification, certification, and authorisation of personnel
- the scope of NDT activity undertaken
- the procedures for performing those NDT activities
- the responsibilities of the people involved with the provision of NDT.

The written practice should be approved by the nominated NDT Level 3 person as required by the standard.

5.3 AMC 43.66(a) Nominated NDT Level 3 Person

Each NDT provider should nominate a person responsible to the Chief Executive or Accountable Manager for the technical supervision of NDT. To be acceptable to the Director this person should hold independent certification at NDT Level 3 and be suitably experienced in aerospace and will be referred to as the nominated Level 3 person. This person should be identified within the written practice.

In considering the suitability of the nominated Level 3 person, the level of aerospace experience is to be appropriate to the type of NDT being performed by the NDT provider. Experience gained in the (NDT) inspection of aircraft parts and the understanding of the technology with respect to aircraft construction should be taken into account. These considerations should be reflected in a bias to the questioning during assessment.

The Director may accept a NDT Level 3 person external to the NDT provider to be the nominated Level 3 person provided there is a written agreement between the parties setting out the responsibilities of the nominated person.

An NDT provider needs to have a nominated Level 3 person who is qualified in all the NDT methods used by the NDT provider. This may require more than 1 nominated Level 3 person.

It is crucial that the nominated Level 3 person has a level of cooperation from the NDT provider (such as access to facilities, documents and data, training records, audit and inspection reports, etc.) to allow that person to fully discharge his or her duties. As a minimum, those duties would include:

- Identify any additional independently certified Level 3 personnel necessary for coverage when the nominated Level 3 person is not qualified in all NDT methods used by the NDT provider, and, when necessary, for day-to-day requirements of the NDT provider.
- Approve, and regularly review*, the NDT provider's written practice for the training and certification of NDT personnel as meeting NAS410 or EN4179. A copy is to be provided to the CAA for acceptance by the Director.
- Approve where applicable, and regularly review* the written practice and NDT procedures to ensure that any changes in legislation, applicable standards and the NDT provider's organisation itself are reflected.
- Ensure that regular* technical audits (both system and product) are carried out by appropriately qualified personnel in order to ensure the standard of NDT work carried out in the NDT provider's organisation is maintained.

* It is recommended that these activities take place on at least an annual basis. Review should also take place after significant amendment to applicable standards/specifications.

5.4 AMC 43.66(a) NDT Personnel

NDT providers will need to ensure that they have adequate numbers of suitably qualified staff to satisfy the scope of NDT work undertaken.

The Director accepts the European PCN (Personnel Certification in Non-destructive Testing – administered by the British Institute of Non-destructive Testing) Level 3 certified personnel under EN473, and independently centrally certified American Society for Non-Destructive Testing (ASNT) Level 3 personnel (including ACCP) as suitable for the position of a nominated Level 3 person provided they are suitably experienced in aerospace under NAS410 and/or EN4179.

The Director may also accept personnel certified to appropriate levels by the NZ CBIP subject to the NDT provider's written practice as described above.

5.5 AMC 43.66(a) Visual Acuity

A print font of Times Roman N4 is acceptable as equivalent sized letters to meet the near vision requirement of NAS 410. It is not acceptable to use a chart that has been produced from a PC and printer. The NAS 410

standard requires the visual acuity test be administered at a distance of 16 inches (400 to 450 millimetres is an acceptable distance range).

6. NDT INSPECTIONS

6.1 AMC 43.66(b) NDT I.A.W NDT Written Practice

NDT inspections should be performed by a person who is authorized in accordance with the NDT provider's written practice.

Where NDT procedures are specified by the organization responsible for the design and/or manufacture of an aircraft or component, those procedures must be followed for any NDT on the aircraft or component, except where a change is permitted or approved by that design or manufacturing organization as detailed in the following section on approval of NDT procedures.

Where a non-mandatory NDT inspection is to be performed and the organization responsible for the design and/or manufacture of the aircraft or component has not specified a procedure, then the method, technique, procedure and instruction should be prepared in accordance with the following section on the approval of NDT procedures and approved by an NDT Level 3 person qualified in the applicable method.

6.2 AMC 43.66(b) Approval of NDT Procedures

NDT techniques, procedures and instructions, specified in an NDT Manual, Service Bulletin, Approved Drawing, etc. by the holder of a type certificate for an aircraft, product or component constitute airworthiness data for the aircraft or component.

Where the airworthiness data published by the holder of a type certificate permits changes to the NDT techniques, procedures or instructions (e.g. selection of equipment model, probe type etc.) then such changes may be determined, to the extent documented in the NDT providers written practice, by a Level 2 person who is qualified and experienced in the appropriate method. Any other change requires the written agreement of the type certificate holder responsible for the design of the aircraft, product or component and the nominated Level 3 person before such a change is implemented.

NDT Instructions prepared by a Level 2 person should be approved by a Level 3 person qualified in the applicable method.

The procedure for the control of all NDT techniques, procedures and instructions, including their preparation and authorisation within any NDT provider's organisation, should be detailed in the NDT provider's written practice.

6.3 AMC 43.66(b) Certification of NDT Inspections

The certification of an NDT inspection should be considered separately from the provisions of Part 43 Subpart C – Release to Service.

- As explained in the introduction, the basis of NDT personnel training and qualification, and the associated documentation, is conformance to a standard external to the Civil Aviation Rules (but acceptable to the Director). Demonstrated adherence to a standard will provide a level of confidence in the performance of NDT that is equivalent to that which would be provided had that standard been written directly into the rules.
- Part 43 requires a certification for release-to-service of an aircraft or component to be made by a person who meets the requirements of rule 43.101. However, a person who is qualified to perform NDT inspections does not often meet the requirements of rule 43.101 for certifying an aircraft or component for release-to-service. Conversely, the person certifying the release-to-service is most often not qualified to perform or certify the NDT inspection.

- In addition, an NDT inspection is seldom the final maintenance activity before a component is actually returned to service. The NDT inspection may have detected a crack in which case the component would have to be assessed to determine whether it is within the manufacturer's specifications and is in an airworthy condition.

These factors, when considered together, make the certification criteria under rule 43.103 inappropriate when an NDT operator certifies an NDT inspection.

Consequently, for the certification of a component for release-to-service following an NDT inspection, an NDT inspection report should accompany the component and contain at least the following:

- the name of the person or organisation responsible for the NDT inspection
- the component(s) being inspected
- details of the inspection performed/identity of the NDT procedure
- the date of the NDT inspection
- the equipment used
- the result(s) of the inspection
- the name, signature and certificate/authorisation number of the NDT inspector.

The information in the NDT inspection report will allow the user of the component to determine that the required work has been performed, and that approved data was used. Knowledge of the NDT provider, by means such as supplier audit, can provide the component user with an assurance that the NDT provider and the inspecting person are approved to perform the work. Thus the person certifying the component for release-to-service can have the confidence that the NDT requirements of rule 43.67 have been met and therefore the requirements of rule 43.105 can be satisfied for certifying the release-to-service.

Normally, an NDT Level 2 or Level 3 person will sign for the completion of an NDT inspection. If the Level 2 or Level 3 person also holds a certificate of maintenance approval issued under Part 66, that person may certify the aircraft or component for release-to-service following an NDT inspection provided that privilege is detailed on the maintenance approval.

An NDT Level 1 or Level 1 Limited person may sign for an NDT inspection if the following criteria are met:

- an NDT Level 3 person determines that the inspection procedure has clearly defined accept/reject criteria
- the written instruction for the NDT inspection specifically identifies the part, feature or assembly that is being inspected
- the NDT Level 1 or Level 1 Limited person is specifically authorised to perform the inspection
- This circumstance is detailed in the NDT provider's written practice.

Where an NDT Level 3 person is required to certify NDT inspections then that person should be able to provide evidence of practical examination and maintenance of continuity in practical application of the test method and technique.

6.4 AMC 43.66(b) Subcontractors Providing NDT Services

A NDT provider who uses a subcontractor to perform an NDT inspection should detail in their exposition or management system the means that is used to ensure that a subcontracted person is properly trained and authorized.

The relationship of a subcontractor is with the primary NDT provider and not with the owner or custodian of the aircraft or aircraft component.