

Advisory Circular

NON-DESTRUCTIVE TESTING – TRAINING, QUALIFICATION AND CERTIFICATION OF PERSONNEL

GENERAL	1
PURPOSE	1
APPLICABILITY	1
RELATED REGULATIONS	1
RELATED ADVISORY CIRCULARS	1
CANCELLATION	2
EFFECTIVE DATE	2
OTHER REFERENCES	2
1 DEFINITIONS	3
2 INTRODUCTION	4
3 ACCEPTANCE OF RESPONSIBLE LEVEL 3 PERSON	4
4 CONTROL OF QUALIFICATION AND CERTIFICATION PROGRAMMES	5
5 ADEQUATE NDT LEVEL 3 PERSONS	6
6 CONTROL OF NDT PROCEDURES	7
7 INSPECTIONS AND CERTIFICATION OF INSPECTIONS	7
ANNEX A TERMS OF REFERENCE FOR A RESPONSIBLE LEVEL 3 PERSON	8
ANNEX B SCOPE OF AGREEMENT FOR APPOINTING A LEVEL 3 PERSON EXTERNAL TO THE AMO	8

GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 3C of the Air Navigation Act (Cap. 6) (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

PURPOSE

This Advisory Circular provides guidance to demonstrate compliance with, and information related to, requirements regarding the qualification, certification and authorisation of personnel performing in non-destructive testing (NDT).

APPLICABILITY

This AC is applicable for a SAR-145 Approved Maintenance Organisations (AMO) (other than an organisation approved under Subpart D of SAR-145).

RELATED REGULATIONS

This AC relates specifically to Paragraphs 145.30(e), 145.30(ea), 145.30(eb), 145.30(ec), 145.30(ed) and 145.30(ee) in Part 145 of the Singapore Airworthiness Requirements (SAR-145).

RELATED ADVISORY CIRCULARS

- AC 145-2 Requirements for Approval of Certifying Staff

CANCELLATION

This AC is the first AC issued on this subject.

EFFECTIVE DATE

This AC is effective from 13 November 2018.

OTHER REFERENCES

- EN4179, Aerospace series – Qualification and Approval of Personnel for Non-destructive Testing;
- NAS410, National Aerospace Standard Certification and Qualification of Non-destructive Test Personnel;
- ISO/IEC 17024, Conformity Assessment – General Requirements for Bodies Operating Certification of Persons; and
- ISO 9712, Non-destructive Testing – Qualification and Certification of NDT Personnel;
- ANSI/ASNT CP-189, ASNT Standard for Qualification and Certification of Non-destructive Testing Personnel.

1 DEFINITIONS

ACCP: ASNT Central Certification Programme

ANDTBF: Aerospace NDT Board Forum

ASNT: American Society for Non-destructive Testing

ANSI/ASNT CP-189: American National Standards Institute/American Society for Nondestructive Testing Standard CP-189

Certification (of an NDT personnel): A written statement by an employer (AMO) that an individual has met the applicable requirements of this standard (EN4179 or NAS410).

Authorised Qualification (or Qualifying) Body: A body, independent of the employer, authorised by the certification body to prepare and administer qualification examinations.

BINDT: British Institute of Non-Destructive Testing

Certification Body: A body that administers procedures for certification according to specified requirements.

COSAC: COmite Sectoriel Aerospatiale de Certification

Design Approval Holder: A holder of a type certificate, a part manufacturer approval or a technical standard order authorisation.

NDTSS: NDT Society (Singapore)

NANDTB: National Aerospace NDT Board

NDTSS/NANDTB: The organisation recognised by the DGCA as the national aerospace NDT board representing the aerospace industry in Singapore. The organisation is a Committee of NDTSS.

Outside Agency: An independent company or organisation outside the AMO who provides NDT services to implement the requirements of this standard, such as training and examination of NDT personnel.

PCN/AERO: Personal Certification in NDT/AERO

Responsible Level 3 person: A Level 3 person designated by the AMO with the responsibility and authority to ensure that the requirements of this standard (EN4179 or NAS410) are met and to act on behalf of the AMO.

UK NANDTB: UK National Aerospace NDT Board

Written Practice: A document that describes an AMO's requirements and methodology for controlling and administering the NDT personnel qualification and certification (as defined in EN4179, certification denotes authorisation / approval) process.

2 INTRODUCTION

- 2.1 Competent personnel are essential to ensure reliable performance of NDT. As such, the AMO's programme for qualifying and certifying its NDT personnel is critical and has to comply with an established and recognised standard. The standard should be comprehensive and should provide for advances in NDT methods and techniques used by the aviation industry. The EN4179 and NAS410 are the commonly used standards in the aerospace sector. CAAS has adopted these standards as its airworthiness requirement for NDT.
- 2.2 The EN4179 and NAS410 standards hold the organisation solely responsible for the certification of its NDT personnel. In support of this obligation, these standards mandate that the AMO designate a NDT Level 3 person (also known as Responsible Level 3 person) to develop and maintain a Written Practice that details the AMO's qualification and certification programme. The Written Practice should be in accordance with EN4179 or NAS410 and has to be approved by the Responsible Level 3 person.
- 2.3 While the standards are prescriptive on the experience, training and examination structure for qualifying and certifying NDT personnel, the administration and management of these prescribed requirements are determined by the AMO. The Responsible Level 3 person has the sole responsibility for the development and conduct of NDT qualification examinations. Therefore, it is essential that the Responsible Level 3 person is competent and has sufficient industry experience to undertake this role.
- 2.4 An independent organisation is needed to ensure consistent implementation of standards (EN4179 or NAS410) by AMOs. CAAS has adopted, as its requirement, that the implementation of EN4179 or NAS410 be under the control of an independent organisation, the NANDTB, as defined in the standards. To meet this requirement, several AMOs have come together to form the Singapore NANDTB. The board that is formed operates as a Committee of NDTSS leveraging on NDTSS' administrative and management systems. CAAS recognises NDTSS/NANDTB as Singapore's NANDTB.
- 2.5 CAAS' acceptance of a Responsible Level 3 person and the provision of examination services under the control of an NANDTB are prescribed as requirements in the SAR-145.

3 ACCEPTANCE OF A RESPONSIBLE LEVEL 3 PERSON

- 3.1 SAR-145.30(ea) requires that an AMO seeks the DGCA's acceptance of its Responsible Level 3 person. The nomination should be submitted using CAAS Form AW(22), supported by evidence of the qualifications and experience of the nominated person.
- 3.2 The nominated person should hold an independent NDT qualification at Level 3 and certified in accordance with EN4179 or NAS410 in one or more of the NDT methods used by the organisation.
- 3.3 Level 3 qualification(s) from one of the following bodies are acceptable to the DGCA:
 - NDTSS' Authorised Qualifying Bodies for Aerospace meeting the examination requirements of EN4179 or NAS410;
 - BINDT's Authorised Qualifying Bodies for PCN/AERO certification;

- Outside Agencies for Aerospace approved by NDTSS/NANDTB, UK NANDTB or COSAC meeting the examination requirements of EN4179 or NAS410;
 - Other recognised NDT personnel certification schemes for Aerospace administered by an ISO/IEC 17024 Certification Body;
 - ASNT or ACCP meeting the examination requirements of ANSI/ASNT CP-189.
- 3.4 Possession of ASNT or ACCP qualifications in paragraph 3.3 may be considered as satisfactory evidence that the general examination requirement is satisfied as defined in the AMO's Written Practice.
- 3.5 The nominated person must also demonstrate evidence of specific knowledge and experience appropriate to the AMO's scope of work in accordance with the EN4179 or NAS410.
- 3.6 Evidence of the nominated person's knowledge of the AMO's scope of work may be shown in training and passing the Specific and Practical examinations on materials, components, product technologies, NDT methods and techniques, specifications and codes that the AMO uses. These examinations can be provided by a NANDTB approved agency (Outside Agency or internal of the AMO) or by the Design Approval Holder of the aircraft / product / component.
- 3.7 The nominated person should be suitably experienced in the aerospace sector. The person should have aerospace experience appropriate to the type of NDT being performed by the organisation. Experience gained in the NDT inspection of aircraft structures / parts and the understanding of the technology with respect to aircraft construction / part manufacture should be taken into account.
- 3.8 The nominated person should acquire the necessary experience by engaging in the AMO's NDT activities for a period of at least 3 months. The actual duration to gain the necessary experience is dependent on the scope of work and the nominee's prior NDT work experience. The AMO may consult the NDTSS/NANDTB on the required duration.
- 3.9 The terms of reference for a Responsible Level 3 person of an AMO are listed in Annex A. An AMO may nominate a Level 3 person external to the AMO as its Responsible Level 3 person provided there is a written agreement between the parties setting out the responsibilities of the person. Annex B provides the scope and some conditions that should be in an agreement.
- 3.10 For an AMO whose principal place of business is in a location other than Singapore, the DGCA may accept the nomination of the incumbent Responsible Level 3 person who has been accepted under the local regulatory system.

4 CONTROL OF QUALIFICATION AND CERTIFICATION PROGRAMMES

- 4.1 While the EN4179 and NAS410 standards provide two means to control the training and examination programme for qualifying NDT personnel, viz. a NANDTB or by the AMO with a programme approved by its Responsible Level 3 person, all NDT personnel in an AMO whose principal place of business is in Singapore must undergo examinations conducted by personnel, agency or organisation under the control of an acceptable NANDTB.

- 4.2 For the purpose of SAR-145.30(eb), the DGCA considers the following as an acceptable NANDTB:-
- (a) NDTSS/NANDTB;
 - (b) UK NANDTB; or
 - (c) COSAC.
- 4.3 In Singapore, the DGCA recognises the NDTSS/NANDTB as the industry representative body to provide or support NDT qualification and examination services in accordance with EN4179 or NAS410 standards. Examinations that are administered by agencies (Outside Agencies or internal of the AMO) approved by NDTSS/NANDTB are acceptable to the DGCA.
- 4.4 The DGCA may accept qualification by either Outside Agency approved by the UK NANDTB (the approval programme is managed by BINDT) or an examination centre approved by COSAC, provided that such Outside Agency or examination centre meets the examination requirements of EN4179 or NAS410.
- 4.5 For the avoidance of doubt, additional training associated with new equipment, new product lines, new operating practices etc. is considered to be on-the-job training and does not fall under the NANDTB ambit.
- 4.6 Where the AMO's principal place of business is in a location other than Singapore, the DGCA may consider the following as an acceptable means of certification: -
- (a) the services of other NANDTB's may be used. Training, qualifications and certification under the control of other NANDTB who is a member of ANDTBF may be accepted on the condition of approval/acceptance by the local airworthiness regulating authority; or
 - (b) local national qualification may be acceptable, provided that it is equivalent to EN4179 or NAS410 and the qualification has obtained the local airworthiness regulating authority's approval/acceptance.

5 ADEQUATE NDT LEVEL 3 PERSONS

- 5.1 The AMO should ensure that it has adequate qualified Level 3 persons to provide day-to-day technical coverage of its NDT operations.
- 5.2 As a guide, a ratio of one Level 3 person for every 20 Level 2s would be acceptable. However, the AMO should determine the ratio that is commensurate with the size and complexity of its NDT operations.
- 5.3 Where the Responsible Level 3 person is not qualified in an NDT method used in the AMO, the AMO may engage an additional Level 3 person, either through direct employment or externally contracted to provide coverage in that NDT method.
- 5.4 The AMO should also ensure that an externally contracted Level 3 person can commit adequate man-hours to cover the technical supervision of its NDT operations.
- 5.5 The additional Level 3 person in paragraph 5.3 should hold a Level 3 qualification and certified / authorised as detailed in paragraph 4.
- 5.6 The AMO should identify its additional Level 3 persons in its Written Practice.

6 CONTROL OF NDT PROCEDURES

- 6.1 NDT techniques, procedures and instructions specified in an NDT Manual, Service Bulletin, Approved Drawing, etc. by the Design Approval Holder for aircraft, product or component constitute airworthiness data. These data should be used in the NDT inspections except where change is permitted or approved by the Design Approval Holder
- 6.2 Notwithstanding that a Level 3 person may be qualified via EN4179 / NAS410 to establish and authorise methods, techniques, etc, such qualification does not permit the Level 3 person to deviate from methods and techniques published by the Design Approval Holder, unless such data expressly permits such deviation.
- 6.3 Where the NDT inspections are needed for which the Design Approval Holder has not specified NDT procedures for an inspection specific to a part or component or where the airworthiness data published by the Design Approval Holder permits changes to the NDT techniques, a Level 3 person qualified in the appropriate method has to approve the procedures or instructions (e.g. selection of equipment model, probe type etc.).
- 6.4 Where the airworthiness data published by the Design Approval Holder does not expressly permit a deviation of NDT methods and techniques, the AMO should obtain the written agreement of the Design Approval Holder before such a change is implemented. The Level 3 person has to coordinate with the Design Approval Holder to ensure that the selected NDT inspection provides an appropriate level of defect sensitivity and probability of detection to the intended application.
- 6.5 NDT Instructions prepared by a Level 2 person should be approved by a Level 3 person qualified in the applicable method.
- 6.6 The procedure for the control of all NDT techniques, procedures and instructions, including their preparation and approval within the AMO should be detailed in the AMO's operations manual (for example Quality Procedures Manual, or NDT Operations Manual).
- 6.7 These NDT procedures should be reviewed at least once every 12 months, and technical audits (both system and product) should be carried out or supported by appropriately qualified person at least once every 12 months.

7 INSPECTIONS AND CERTIFICATION OF INSPECTIONS

- 7.1 NDT inspections should be carried out by personnel authorised in accordance with the AMO's Written Practice.
- 7.2 Where certification for release to service following an NDT inspection is required using CAAS (AW) 95, the certifying staff should be qualified and authorised in accordance with AC 145-2.

ANNEX A TERMS OF REFERENCE FOR A RESPONSIBLE LEVEL 3 PERSON

The Terms of Reference for the Responsible Level 3 person should include:

- a. Approve the AMO's Written Practice for the training and qualification of NDT personnel in accordance with EN4179 or NAS410 and this AC;
- b. Identify and designate individual or approved agencies or organisations responsible for administering qualification examinations including visual acuity examinations;
- c. Identify and designate Level 3 person or Outside Agency as examiner to administer all or part of the qualification process in the NDT methods in which the examiner is certified;
- d. Identify and designate Level 3 person or Outside Agency as instructor to provide training for NDT personnel;
- e. Organise and document programme of learning activities designed to impart the knowledge and skills necessary to be qualified to the standard;
- f. Verify training received by the NDT personnel from approved agencies meets the organisation's requirements as outlined in its Written Practice or NDT training outlines; and
- g. Review the AMO's Written Practice for training and qualification at least once every 12 months to ensure compliance with EN4179 or NAS410 and this AC, and that any changes in the NDT requirements, applicable standards and codes and the AMO's NDT operations itself are reflected.

ANNEX B SCOPE OF AGREEMENT FOR APPOINTING A LEVEL 3 PERSON EXTERNAL TO THE AMO

The AMO and the external Level 3 person should include the following in the written agreement between them:

- a. The external Level 3 person's responsibilities within the AMO;
- b. The commitment of the external Level 3 person on the minimum amount of time and on site presence to discharge his/her responsibilities for the technical supervision of NDT;
- c. Where external Level 3 person is employed by another organisation, the agreement should include the individual obtaining an official consent of the external employer contracting out the services of the particular Level 3 person;
- d. The external Level 3 person should visit the AMO at least once every 12 months. Additional visits may be required depending on the size, complexity, stability of the AMO and the scope of the NDT activities carried out; and
- e. The external Level 3 person will be provided with the necessary co-operation (access to facilities, company procedures, training records, audits and inspection reports etc) to allow that person to carry out his/her functions.