



ADVISORY CIRCULAR AC 05-007

GUIDELINES FOR SPECIALIZED MAINTENANCE ACTIVITIES (WELDING OF AERONAUTICAL PRODUCTS AND NON DESTRUCTIVE TESTING)

SECTION 1 GENERAL

1.1 PURPOSE

This Advisory Circular (AC) is to provide guidance for personnel intending to or who are engaged in Specialized Maintenance Activities. Such activities referred to in this AC are Non Destructive Testing methods and Aircraft Welding.

1.2 STATUS

This is an original issue of this AC.

1.3 APPLICABILITY

This AC is applicable to all maintenance organization and maintenance personnel who are engaged in the specialized maintenance activities of Non Destructive Testing or Welding.

1.4 RELATED REGULATIONS

The following regulations are directly applicable to the guidance contained within this AC -

- Bahamas Aviation Safety Regulations (2010) Schedule 8 – Subdivision VI – Aviation Repair Specialist

1.5 RELATED PUBLICATIONS

For further information on the topics covered in this AC,, individuals, organizations and other entities are invited to consult the following publications –

- Federal Aviation Administration Advisory Circular AC43-13, Chapter 4 – Welding and Chapter 5 – Non Destructive Inspection
- United Kingdom Civil Aviation Aircraft Inspection Procedures (CAAIP)
- Bahamas Civil Aviation Advisory Circular AC 05-008 – Personnel Certification for Non Destructive Testing of Aircraft, Engines, Components and Materials

SECTION 2

2.0 DEFINITIONS

For the purpose of this advisory circular the following definitions apply –

Note: These definitions were derived from NAS 410, other documents may use these same terms with differing meanings. When interpreting other documents the intent of the meaning should be established when referring back to this advisory circular.

Authorization (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.

Authorization (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.

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 utilizes 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 organization 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. CBIP), or by a body authorized 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 advisory circular, 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 organization's wider exposition or procedures.

SECTION 3 GUIDANCE AND PROCEDURES

3.1 Introduction

The AC only provides guidelines, however the specific qualification requirements shall be as determined by the respective test equipment and welding equipment manufacturers unless where other overriding instructions are given in this regard.

The procedures shall include minimum requirements for professional qualification and for certifying personnel involved in such maintenance activities. Minimum requirements shall require the Organization's Quality System Procedures to include Qualification procedure for specialized activities such as Non-Destructive Testing, Welding, etc This will cover but not be limited to the following:

- a) Initial training,
- b) Skills & experience,
- c) Examinations,
- d) Medical examinations as applicable,
- e) Recurrent training.

3.2 Aviation Repair Specialist Authorization

Under the provisions of BASR 2010 (Personnel Licensing), the Authority may issue applicable classes of to personnel qualified to perform specific methods of NDT and welding.

3.3 Non Destructive Testing (NDT) Common Methods

i. NDT methods commonly used include but are not limited to the following;

- a) Liquid Penetrant
- b) Magnetic Particle
- c) Eddy Current
- d) Ultra Sonic
- e) Radiography (X-Ray)

ii. **The terms 'Non Destructive Testing and Non Destructive Inspection'**

These are sometimes used interchangeably but it is important to note that there is a slight difference between the two. The 'Testing' methods include those listed above and the 'Inspection' methods include processes like borescope inspection and coin tapping for delaminating inspection.

3.4 Levels of Qualification

According to basic international practices, the following levels of qualification are used in the training and capacity building of NDT personnel;

a) Trainee

Is an individual who is at the early stages of skills acquisition in NDT. The individual shall be taken through a Training Programme developed by the Organization and approved by the Authority. In addition to theoretical class-room work, the individual shall obtain work experience under the guidance of Level 2 or 3 personnel in the same method studied in the theoretical part. Any guidance from Level 1 personnel should be very limited and should be supervised by Level 2 or Level 3 personnel.

b) Level 1

The Level 1 inspector shall have the skills and knowledge to prepare, process and perform limited tasks in accordance with written and approved instructions under the supervision of Level 2 or Level 3 personnel. Level 1 inspector shall not have certification authority and should be taken through phases of the approved Training Programme.

c) Level 2

The Level 2 inspector shall have the skills and knowledge to set up test equipment, conduct tests, interpret and evaluate results for acceptance or rejection of parts undergoing test. The individual shall be capable of providing necessary guidance and supervision to Level 1 and Trainee personnel. This level may perform tasks without direct supervision of Level 3 personnel. Unless other considerations are made and approved by the Authority in writing, Level 2 personnel may be granted limited certification authority on dye penetrant testing only.

d) Level 3

The Level 3 inspector shall be qualified to perform applicable processes to a high degree of accuracy. Level 3 personnel shall have certifying authority limited to the methods that they are qualified on. The individual should be capable of :

- i. Guiding and supervising all levels below Level 3,
- ii. Providing direct training,
- iii. Provide practical examination,
- iv. Assisting in assessment of personnel for qualification purposes,
- v. Be capable of assisting in an audit of subcontracted organizations in the NDT methods of qualification.

e) Instructor (optional)

The inspector shall have the skills and knowledge to perform the following;

- i. Plan and organize training,
- ii. Present classroom training,
- iii. Conduct practical exercises,
- iv. Perform On Job Training,
- v. Conduct theoretical and practical examinations,
- vi. Participate in the qualifying process for certifying personnel
- vii. Develop work instructions,
- viii. Be capable of conducting an audit of subcontracted organizations in the NDT methods qualified on.

3.5 Other Methods of NDT

Other methods of NDT which can be used are but not limited to:

- i. Acoustic Emission,
- ii. Neutron Radiography,
- iii. Penetrant Leak Testing,
- iv. Thermography,
- v. Holography and
- vi. Computer Tomography.

SECTION 4.0 AIRCRAFT WELDING

4.1 Definition

i) Primary Structure:

A Primary Structure is a structure which contributes significantly to carrying flight, ground or pressurization loads, and whose failure could result in catastrophic failure of the aircraft.

Note: Examples of a Primary Structure are: Tubular fuselage structure, wing or tail plane structure, control surfaces and their attachments, spar caps and webs, door frames, pressurized bulkheads, window

4.2 Welding of Aircraft

You can only carry out maintenance (manual welding), in accordance with approved maintenance data, within the scope of the Authorization.

4.3 Welding of Aircraft Components/Materials

You can only carry out maintenance (manual welding), in accordance with the approved maintenance data, on aircraft components or aircraft material within the scope of the Authorization.

4.4 Certification

Certification shall be carried out on the maintenance (manual welding) carried out in accordance with the approved maintenance data, in the documents kept for recording such maintenance under the requirements of the Authority.

4.5 Types of Manual Welding

These shall include but not limited to the following;

- i. Gas Welding,
- ii. Braze Welding,
- iii. Manual Metal Arc Welding,
- iv. Gas Tungsten Arc Welding,
- v. Gas Metal Arc Welding,
- vi. Plasma Arc Welding

4.6 Parent Metal Groups

Parent Metal Groups for which qualification may be sought include but are not limited to the following;

- i. Aluminum Alloys,
- ii. Magnesium Alloys,
- iii. Carbon Steel and Low Alloy Steels,
- iv. Corrosion and Heat Resisting Steels,
- v. Nickel Alloys,
- vi. Copper based Alloys,
- vii. Titanium Alloys.

4.7 Qualifications

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Personnel intending to be, or engaged in aircraft welding shall receive professional training in both theoretical and practical training in the particular type of manual welding and parent metal group qualification sought. The training is expected to cover but not limited to the following subjects;

- i. Safety in Welding,
- ii. Welding Equipment,
- iii. Theory and Application of Welding Processes,
- iv. Welded Joints,
- v. Welding Metallurgy,
- vi. Welding Practice and Production

4.7.1 Training for Experts in Specialized Maintenance

Individuals intending to, or undertaking training in any type of the welding processes shall be provided with professional training at a facility acceptable to the Authority. Training provided shall be in accordance with a BCAD/FSI approved Training Programme. Records of such training/associated examinations undertaken and certificate awarded shall be copied /submitted to the Authority as appropriate.

4.7.2 Grant of Approval

The procedures for the issue and control of welding approval are dependant on the employment conditions of the welder. Where a welder is in the employment of an Organization approved by the Authority and where such approval includes the control of welders the Company will have the responsibility for the grant of welder's Authorization. Welders not employed by an organization approved by the Authority, will be granted Authorization by the Authority.

5.0 Visual Acuity Tests

Personnel engaged in NDT and Welding shall have periodic visual acuity tests performed by appropriately qualified medical practitioners. This is to ensure that their vision and color perception meets the required criteria for the precision and accuracy demanded by the trades. The respective Organizations (employers) shall maintain such medical records in confidence and will be subject to inspection by the Authority inspectors.

6.0 Other Specialized Maintenance Activities

Approved Maintenance Organizations engaged in '**Metal Plating and Borescope Inspections**' shall also be required to develop training and qualification procedures for personnel performing such functions. All training shall be as guided by equipment manufacturers and where applicable shall be tailored to include specific requirements of aircraft manufacturers.

7.0 Training and Qualification

- i) The Authority shall recognize and accept training standards and qualifications approved or recognized by the European Aviation Safety Agency (EASA), the Federal Aviation Administration (FAA) and Transport Canada (TC).
- ii) The Authority shall recognize and accept any other training and qualification that are acceptable and approved by the Director of Civil Aviation.

End of Advisory Circular