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## AC-AW 005

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

#### 1.0 PURPOSE

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

#### 2.0 REFERENCES

- 2.1 Regulation 10 of Malawi Aviation (Personnel Licensing) Regulations, 2013
- 2.2 Sixth Schedule to Civil Aviation (AMO) Regulations.

#### 3.0 GUIDANCE AND PROCEDURES

##### 3.1 Introduction

The AC provides guidelines only however the specific qualification requirements shall be as determined by 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 limited to the following:

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

##### 3.2 Aviation Maintenance Specialist Authorization

Under the provisions of Civil Aviation (Personnel Licensing) Regulations, 2006 the Authority may issue applicable classes of 'to personnel qualified to perform specific methods of NDT and welding.

###### 3.2.1 Non Destructive Testing (NDT)

###### i) Common Methods

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.

**iii) 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 the trade. The individual shall be taken through a Training Programme developed by the Organisation 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 3 personnel.

**b) Level 1**

The 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 3 personnel. This level shall not have certification authority and should be taken through phases of the approved Training Programme.

**c) Level 2**

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

- i) Guiding and supervising all levels below level 3,
- ii) Providing direct training,
- iii) 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.

### 3.2.2 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.

## 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 frames and engine mountings.

### 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 authorisation.

### 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) Aluminium 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**

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 Specialised 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 Authority 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 dependent on the employment conditions of the welder. Where a welder is in the employment of an Organisation 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 organisation 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 their vision and colour 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) and the Federal Aviation Administration (FAA).
- ii)** The Authority shall recognize and accept any other training and qualification the Director of Civil Aviation may approve.

**End of Circular**

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