Civil Aviation Safety Authority
of Papua New Guinea

Advisory Circular
AC43-14

Welding **Original**

30 September 2024

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 43.67 relating to Welding and provides explanatory material to assist in showing compliance.

RELATED CAR

This AC relates specifically to Civil Aviation Rule Part 43.67.

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.

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1. INTRODUCTION

Civil Aviation Rule 43.67 requires that a person performing maintenance on an aircraft or aircraft component that involves the use of welding 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 aircraft maintenance manuals (AMMs), Structures Repair Manuals (SRMs) or other information for continued airworthiness for the conduct of maintenance including welding, where applicable. CASA also expects Part 145 aircraft maintenance organizations to have procedures and practices on welding clearly documented in their Exposition, as applicable.

CASA issues an Aviation Maintenance Specialist (AMS-2) Certificate under Part 66 Subpart D to appropriately qualified and competent Welding Specialists. The qualification and competence of Welders relies on a robust and strictly controlled Welder certification systems which already exists in the Welding industry in the form of published standards such as the American Welding Society (AWS) Standards, the European Union ISO standards or other equivalent standard. A CASA PNG AMS-2 Certificate issued under Part 66 validates this Industry welding Qualification and serves as an entry control certification for entry into the Aviation Ball Park.

CASA PNG also certificates Part 145 organisations to employ, engage or otherwise contract Welding Specialists to conduct welding on aircraft or aircraft components under their P1-rating and in accordance with procedures in their Exposition, as applicable.

This AC (AC) restates the requirement of rule 43.67(2) that Welding must be performed using appropriate methods, techniques and practices acceptable to the Director. The objective of rule 43.67 is to establish a minimum standard for Welding where Welding is required to ensure the continued airworthiness of aircraft and aircraft components.

Rule 43.67 prescribes requirements for both the personnel performing Welding and the processes used. These requirements are that —

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

Welding by nature is a critical process since a welding 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 the welding activity must rely on controls in the form of certification/approval to an acceptable standard.

These standards require that welding is carried out by appropriately qualified, experienced and certified welders. The management systems that support the standard will ensure that the competency of welders is properly established and maintained.

The standard adopted in this AC is AWS (American Welding Society) standards. It is acceptable to the Director as a basis for the issue of a PNG Part 66 AMS-2 certificate for welding to be carried out on a PNG registered aircraft. AWS also provide initial and recurrency training to maintain a welder’s certification.

Welding 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 43.67 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 welding is also subject to requirements that the manufacturer’s instructions are followed or any deviation to the manufacturer’s instructions are duly approved.

2. EM 43.67 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 maintenance (welding) tasks on PNG registered aircraft.

3. EM 43.67 APPLICABILITY

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

This AC covers only welds that are carried out within welding criteria contained in acceptable technical data and limited to those which can be inspected in accordance with post-weld approved procedures (ie. NDT procedures). Such procedures must include post-weld inspection criteria necessary to determine the airworthiness of the component after approved weld repairs have been accomplished.

Guidance for developing inspection criteria may be obtained by referring to the visual and dimensional limitations contained in manufacturers' maintenance documents. Guidance for developing nondestructive testing procedures may be obtained from referenced industry, and military standards and specifications on inspection and heat treatment techniques. The most common inspection techniques include Dye Penetrant Inspection (DPI) and Fluorescent Penetrant Inspection (FPI) per AMS 2645 or ASTM E1417. Personnel performing NDI must be trained and qualified in the disciplines being performed.

Note: Aircraft maintenance engineers performing welding services should meet the visual acuity requirements specified in section 6.6 of this AC.

4. AMC 43.67 WELDING OF AIRCRAFT

An individual who holds a PNG Part 66 AMS-2 welding approval, may only carry out maintenance (manual welding), in accordance with acceptable technical data, within the scope of their AMS-2 certificate and under an authorization issued by a Part 145 AMO.

5. AMC 43.67 WELDING OF AIRCRAFT COMPONENTS/ MATERIALS

An individual who holds a PNG Part 66 AMS-2 welding approval may only carry out maintenance (manual welding), in accordance with the acceptable technical data, on aircraft components or aircraft material within the scope of their AMS-2 certificate and under an authorization issued by a Part 145 AMO.

6. AMC 43.67 TYPES OF MANUAL WELDING

These shall include but not limited to the following:

(i) Gas Welding,
(ii) Braze Welding,
(iii) Manual Metal Arc Fusion Welding,

(a) Manual metal-arc (MMA) welding
(b) Metal inert gas (MIG) welding, and
(c) Tungsten inert gas (TIG) welding

(iv) Gas Tungsten Arc Welding,
(v) Gas Metal Arc Welding,

(vi) Plasma Arc Welding

6.1 AMC 43.67 Certification

The certification of a welding should be considered separately from the provisions of Part 43 Subpart C – Release to Service.

- The basis of welding 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 welding 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 welding 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 welding.
- In addition, a welding is seldom the final maintenance activity before a component is actually returned to service. A welded material of 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 a welder certifies the completion of a welding task.

Consequently, for the certification of a component for release-to-service following a weld, should be accompanied by a welder's report and contain at least the following:

- the name of the person or organization responsible for the welding
- the component(s) being welded
- details of the welding performed/identity of the welding procedure
- the date of the welding
- the equipment used in the welding
- the result(s) of the welding
- the name, signature and AMS-2/Part 145 AMO authorization number of the welder.

The information in the welder's report will allow the user of the component to determine that the required work has been performed, and that acceptable technical data was used. Knowledge of the welding provider, by means such as a supplier audit, can provide the component user with an assurance that the welding 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 welding 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.

6.2 AMC 43.67 Welding Standards Acceptable to the Director

CASA recognizes the below listed welding standards and will issue a PNG Part 66 AMS-2 certificate to individuals who hold welding credentials issued in accordance with these standards:

(a) American Welding Society (AWS) Standards;

(b) International Organization for Standardization (ISO) Standards;

(c) British Standards (BS); and,

(d) European Union (CEN) Standards.

Some examples of recognized welding standards:

(a) AWS A5.10, Specification for Bare Aluminum and Aluminum Alloy Welding Electrodes and Rods.

(b) AWS B2.1, Standard for Welding Procedure and Performance Qualification.

(c) AWS D17.1, Fusion Welding for Aerospace Applications.

(d) BS EN ISO 14343: 2009 – Welding consumables. Wire electrodes, wires and rods for arc welding of stainless and heat resisting steels.

(e) BS EN ISO 10042: 2005 – Arc welded joints in aluminum and its alloys.

(f) BS 5500 – Specifications for welded pressure vessels.

(g) BS 5135 – Specifications for structural steel.

(h) DEF STA 00-932 – Specifications for tensile steel.

6.3 AMC 43.67 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.

6.4 AMC 43.67 Welding Qualifications

An AMS-2 certificate is issued to the welder by CASA PNG after confirming that welding credentials are valid and current. A welder should also be appropriately authorised by a PNG Part 145 AMO before performing maintenance (welding) tasks on a PNG registered aircraft.

Personnel intending to be engaged in aircraft welding shall receive initial and recurrency 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

6.6 AMC 43.67 Visual Acuity Tests

Personnel engaged in Welding shall have annual periodic visual acuity tests performed by Designated Aviation Medical Examiners (DAMEs) approved by the Director. This is to ensure 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 on-going surveillance and inspection by CASA inspectors.