



**Indicative Course**

**Content**

**for**

**Training in**

**Metal-to-Metal**

**Bonded Repairs**

# Training in Metal-to-Metal Bonded Repair

## General notes

The following recommendations are based on our considerable experience in training aircraft maintenance personnel for structural repair.

The course content has been devised to convey the currently accepted techniques for metal-to-metal bonding using the latest available equipment.

## 3 day course in Metal-to-Metal Bonding

The emphasis of the course is on developing the practical skills necessary to carry out metal-to-metal bonded repairs on metallic structures in accordance with published manufacturers' structural repair manuals. Thus course contains about 80% practical work  
There is enough theoretical content to allow the delegate to produce quality repairs using the correct materials and procedures and to work safely.

The techniques used are those currently recommended in manufacturers' structural repair manuals and emphasis will be placed on strict adherence to these procedures. The importance of quality assurance is stressed throughout and the particular attention is paid to quality control by adopting good practices throughout the repair procedure.

### The main aims of the course are:

- To familiarise the delegate with the materials and techniques used to repair metallic structures using bonding techniques.
  - To provide the delegate with the knowledge to satisfy the appropriate health and safety requirements.
  - To equip the delegate with the knowledge and practical skills required to carry out sound and effective repairs on metallic aircraft components, according to the methods recommended and accepted by the aircraft manufacturers.
  - To provide the delegate with the skills necessary to carry out surface anodising using the phosphoric acid non-tank method (PANTA).
  - To introduce the delegate to the phosphoric acid containment system (PACS) for aluminium anodising as specified by Boeing, and to learn to use it if available.
- To introduce the delegate to the sol-gel (Boegel) process for aluminium conversion as specified by Boeing, and to learn to use it if available.
- To provide the knowledge required to interpret standard structural repair manuals and to relate them to a given repair situation.
  - To satisfy all the relevant quality assurance requirements.

## Outline of the training programme

### Day

**1** am: *Introduction*  
*Epoxy resins*  
Bonding principles  
*Hot bonding* pm: Surface preparation exercise  
Introduction to anodising  
using the PANTA method

### Day

**2** am: *Film adhesives*  
preparations Hot bonding  
Anodising practice  
Confirmation of anodised  
surface pm: Comparison of surface  
Metal-to-metal bonding using  
hot bonding techniques  
Introduction to  
the PACS machine

### Day

**3** am: *Interpretation of*  
*manufacturers' SRMs*  
Introduction to the  
Sol-Gel (Boegel) process  
treatments Hot bonded repair of  
Aircraft  
component using  
film adhesive  
in accordance with SRM pm: Continuation of morning's  
work  
Comparison of SRMs  
Other surface

Items in italics are theoretical topics.  
Items in normal script are practical  
topics

## **Training details:**

### **Day 1 morning:**

Delegates will be introduced to the basics of metal to metal bonding and the reasons that it is becoming more widely used and accepted.

The safe and correct use of epoxy resins will be covered as their well as vacuum hot bonded cure. Delegates will learn the correct methods of bagging up repairs and programming cure cycles.

Health and safety issues will be addressed.

### **Day 1 Afternoon:**

Various surface preparation methods will be investigated. The reasons for surface anodising will be addressed and delegates will be given a demonstration in the use of the non-tank method of phosphoric acid anodising (PANTA method).

### **Day 2 morning:**

An introduction to the use of film adhesives will be followed by practice in the use of the PANTA method and vacuum hot bonding.

Delegates will be shown how to assess the success of the anodising process using reflected polarised light.

### **Day 2 afternoon:**

The samples produced by various surface preparation techniques will be tested and assessed. Delegates will be introduced to the phosphoric acid containment system (PACS) for surface anodising and carry out metal-to-metal bonding using the PANTA method or PACS machine if available and hot bonded film adhesive.

### **Day 3 morning:**

The relevant sections of manufacturers' structural repair manuals relating to metallic repairs will be analysed in detail.

Delegates will be introduced to the sol-gel (Boegel) surface conversion method for preparing aluminium alloys for bonding.

Delegates will perform a metal bonded repair on a metal skinned honeycomb cored component using the SRM and techniques learnt previously.

### **Day 3 afternoon:**

Continuation of component repair and comparison of the various manufacturers' repair methods.

Delegates will be given a chance to evaluate the course.

A brief description of other surface preparation methods and conversion coatings.

## Timing

The timing and duration of the various subjects included in this scheme are based on experience for a reasonably fast working group. The timing and may have to be modified slightly depending on the work rate of the group.

Items included above can be replaced by agreement with all delegates on the course.

All the techniques used in the training are based on those given by aircraft and power plant manufacturers and theory given is current and pitched at a level appropriate to the practical work.

Both theoretical notes and details of repair techniques are provided as a complete set for each delegate in a bound folder. They are backed up by overhead transparencies in the lectures and lecture room exercises and activities where appropriate.

Delegates are encouraged to question, criticise and to suggest improvements to all the techniques learnt during the training since the subject is still growing and even the manufacturers are unsure about the best way to approach some problems.